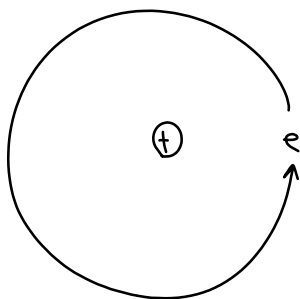


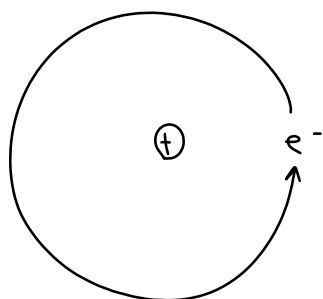
Ch 4 Start e⁻'s

Rutherford's Atomic Model



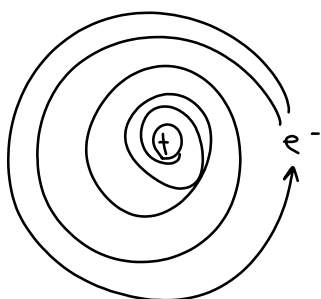
Ch 4 Start e^- 's

Rutherford's Atomic Model



Ch 4 Start e^- 's

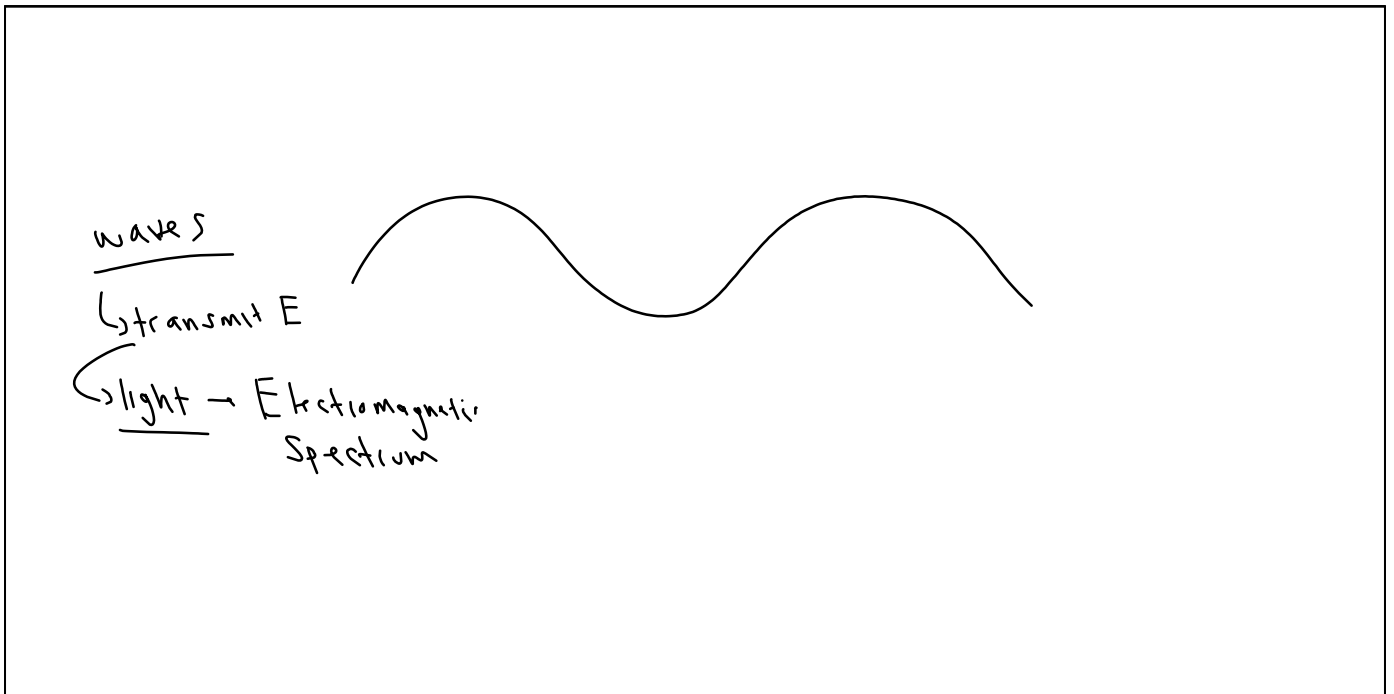
Rutherford's Atomic Model



No explanation of why
 e^- don't crash into the
nucleus

No Explanation of chemical
Reactivity

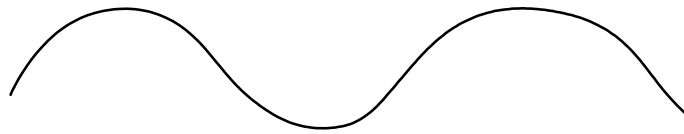
wave 5



waves

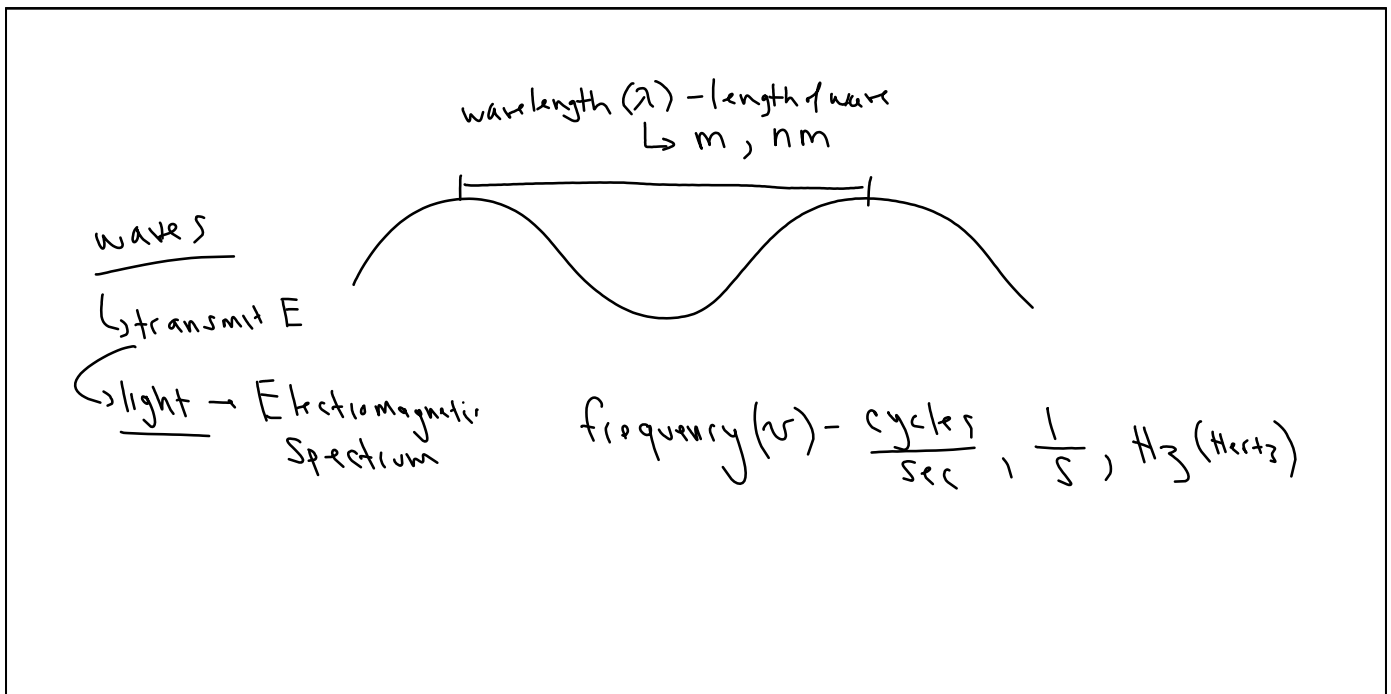
↳ transmit E

↳ light → Electromagnetic
Spectrum

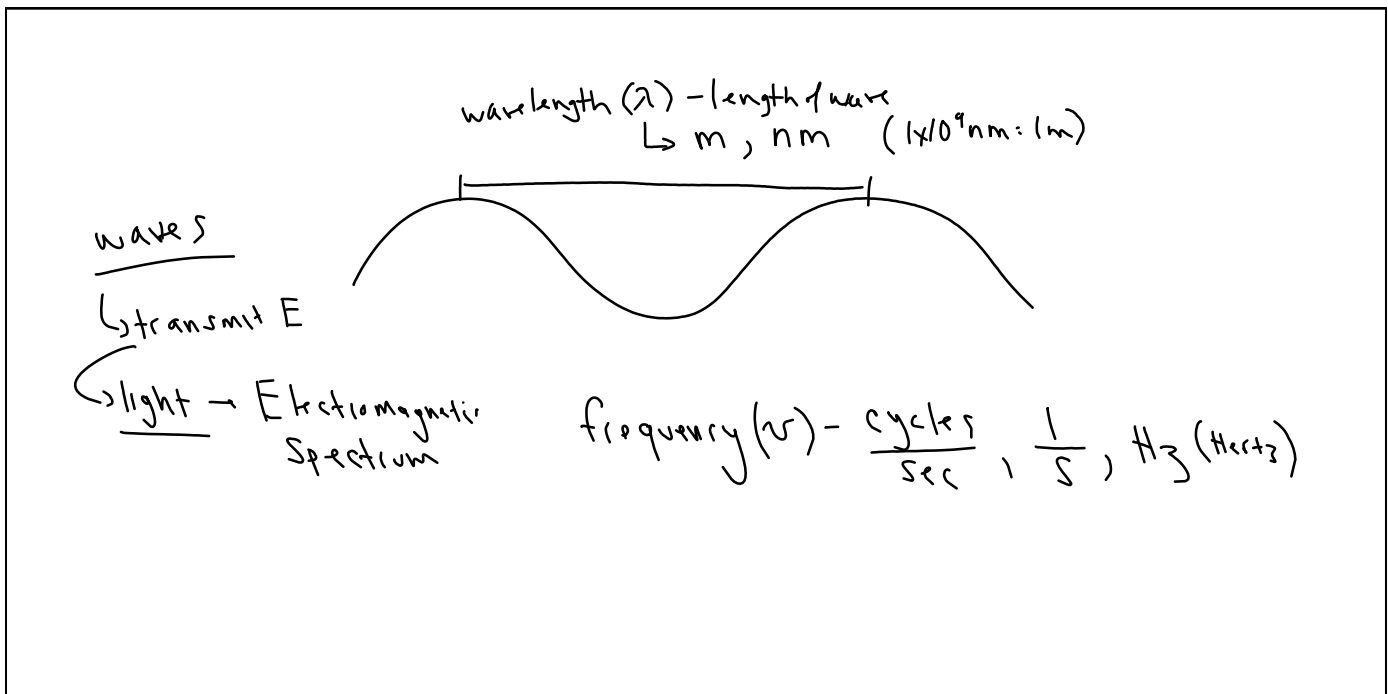


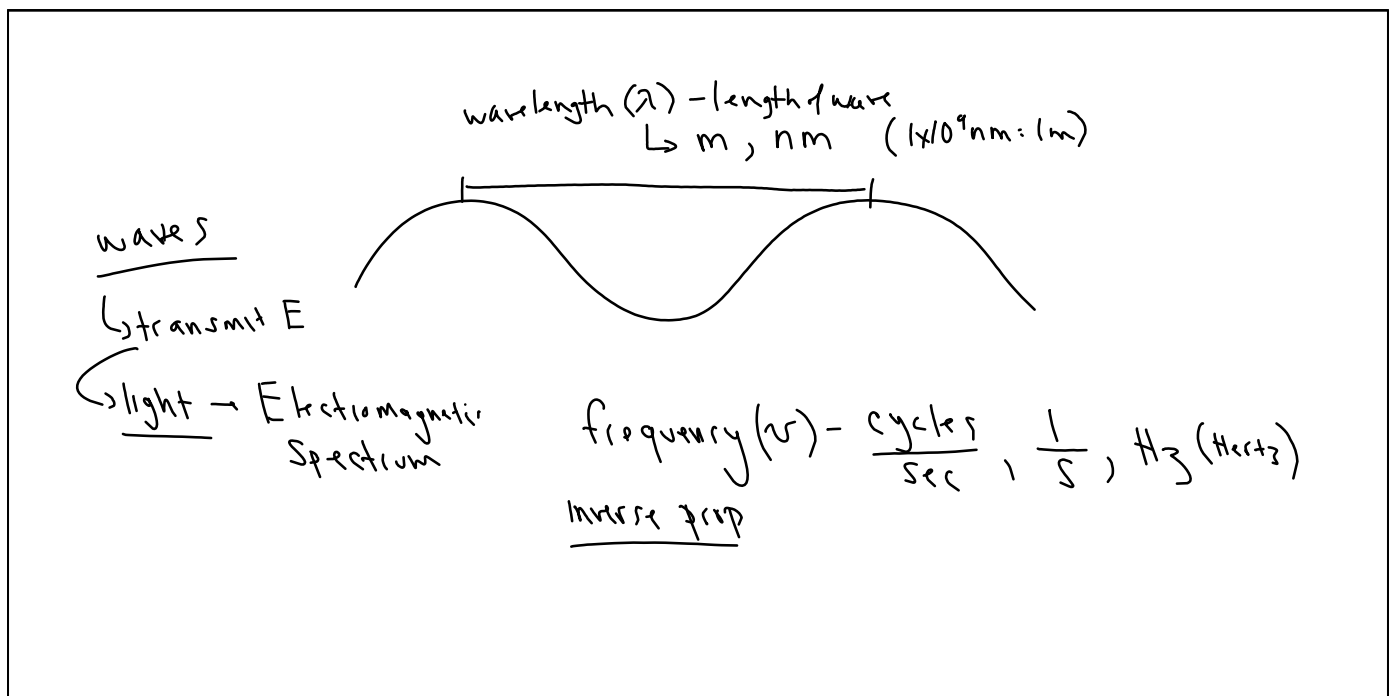
frequency (ν) = $\frac{\text{cycles}}{\text{sec}}$, $\frac{1}{s}$, Hz (Hertz)

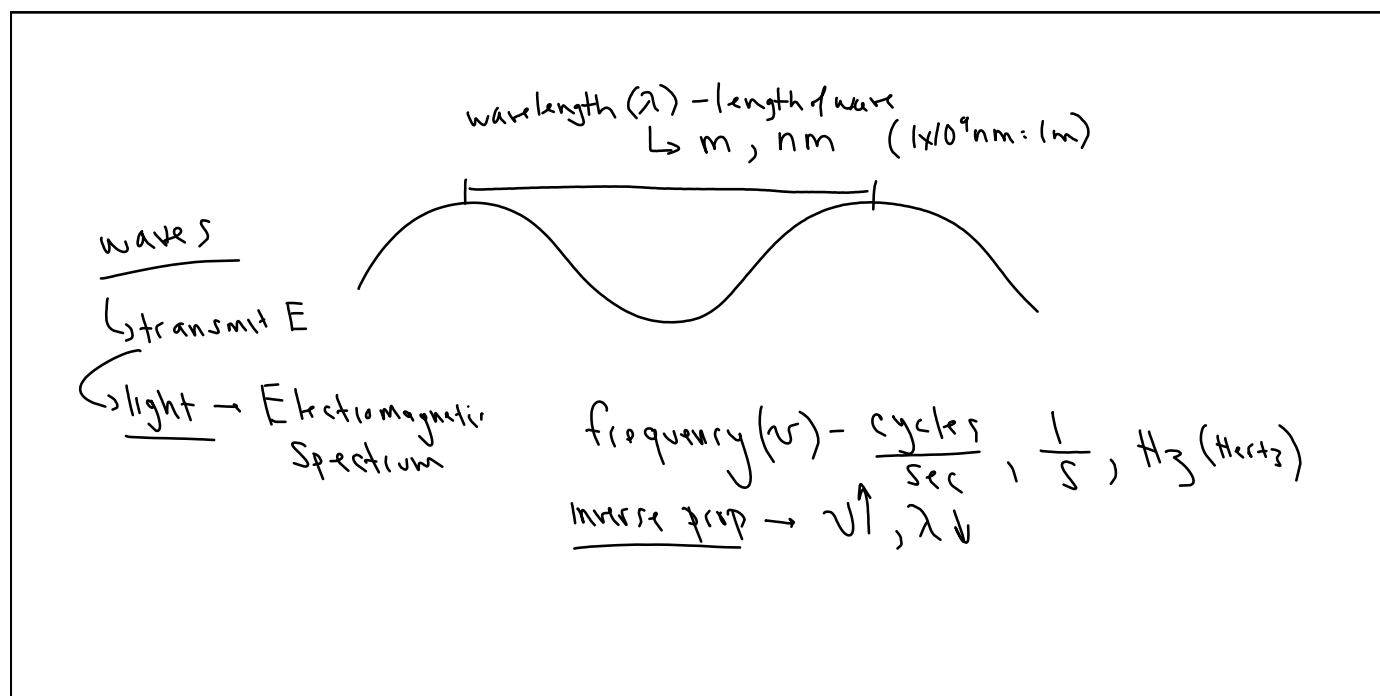
Ch 4 Notes CPA D Block.ink

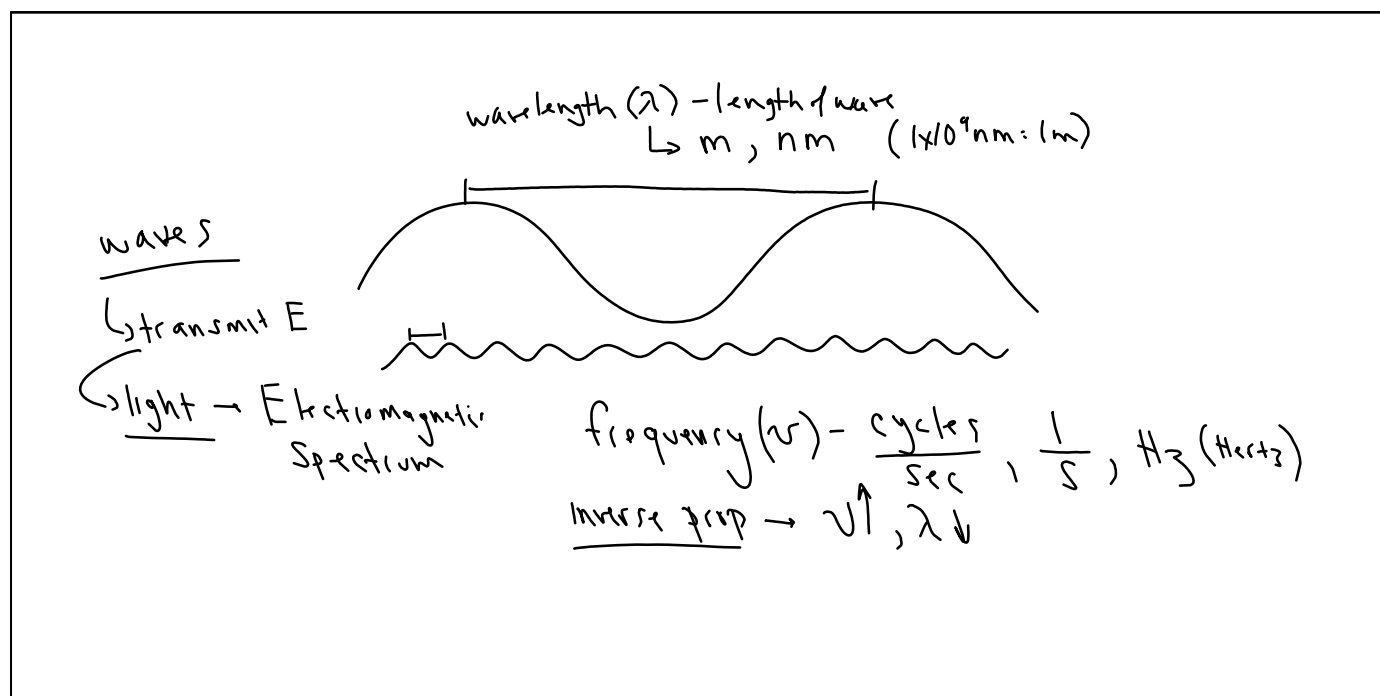


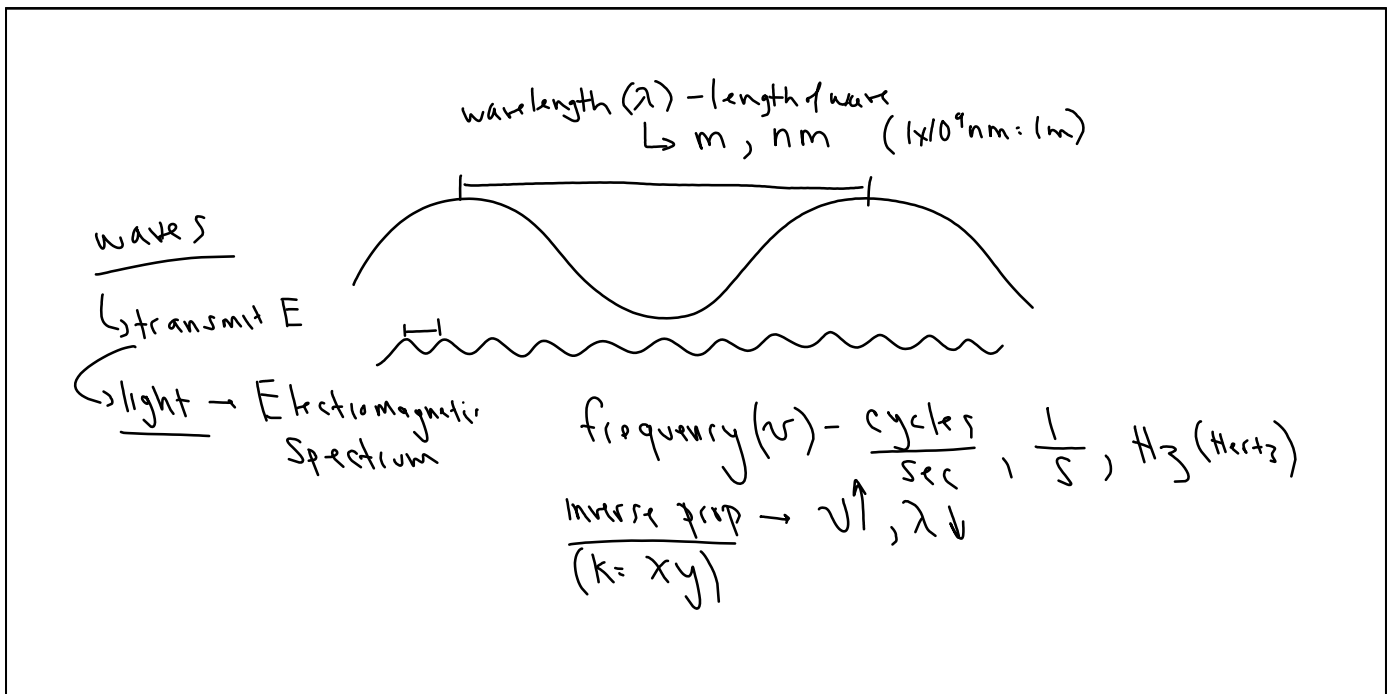
Ch 4 Notes CPA D Block.ink

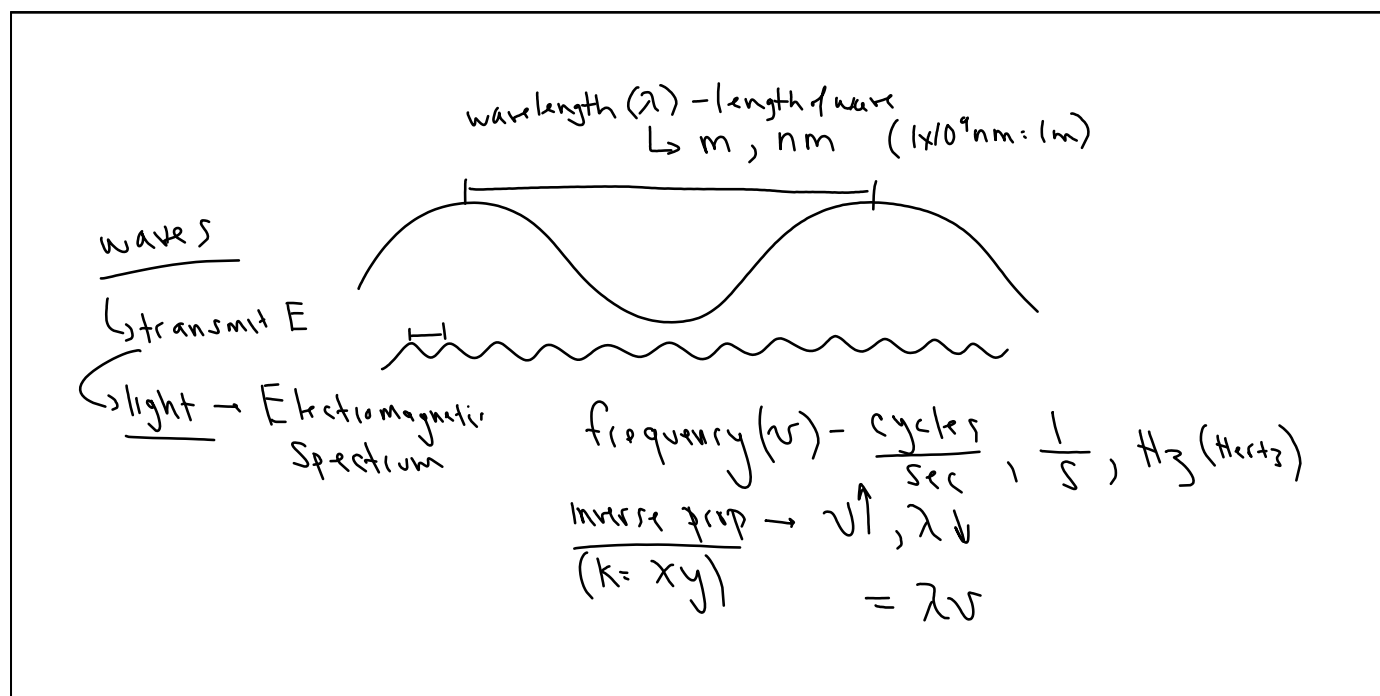








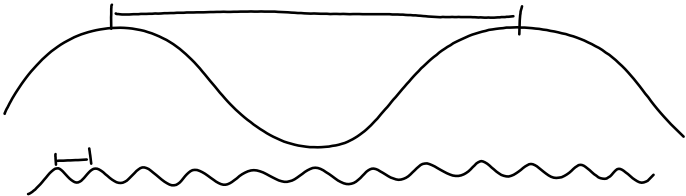




waves
↳ transmit E

light → Electromagnetic Spectrum

wavelength (λ) - length of wave
↳ m, nm ($1 \times 10^9 \text{ nm} = 1 \text{ m}$)



frequency (ν) - $\frac{\text{cycles}}{\text{sec}}$, $\frac{1}{s}$, Hz (Hertz)

inverse prop → $\nu \uparrow, \lambda \downarrow$
($k = xy$) $c = \lambda \nu$

waves

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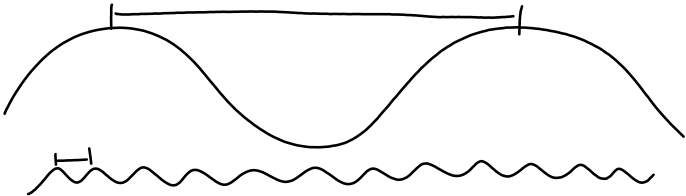
$C = \text{Speed of light} = 3.00 \times 10^8 \frac{\text{m}}{\text{s}}$

wavelength (λ) - length of wave
↳ m, nm ($1 \times 10^9 \text{ nm} = 1 \text{ m}$)

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inverse prop → $\nu \uparrow, \lambda \downarrow$
($k = xy$)

$C = \lambda \nu$



The diagram illustrates an electromagnetic wave. It features a large sine wave representing the electric field (E) and a smaller, higher-frequency sine wave representing the magnetic field (B). A horizontal line with vertical end-caps spans one full cycle of the electric field wave, labeled 'wavelength (λ) - length of wave'. Below this, it specifies units '↳ m, nm (1 × 10⁹ nm = 1 m)'. The magnetic field wave is shown perpendicular to the electric field wave.

2 Phenomena of light not
explained by waves

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1. Hot matter glowing?

2. Photoelectric effect

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 e^- are ejected

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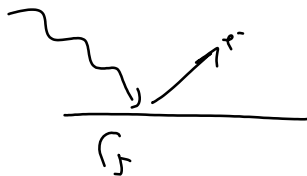
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A diagram illustrating the photoelectric effect. It shows a horizontal line representing a metal surface. Above the line, a wavy arrow points downwards towards the surface, representing an incident photon. Below the line, the letter 'G' is written, likely representing the work function or a ground state.

2 Phenomena of light not explained by waves

1. Hot matter glowing?

2. Photoelectric effect \rightarrow light hits ^{certain} metals
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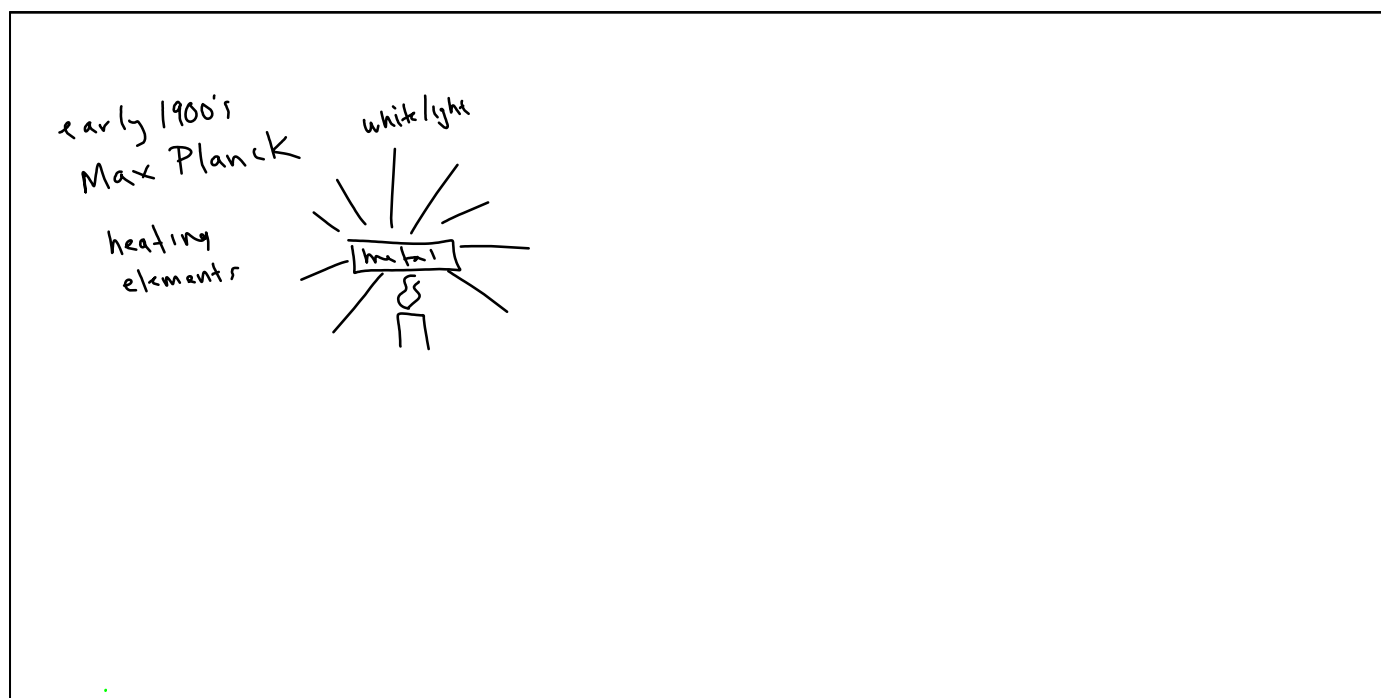


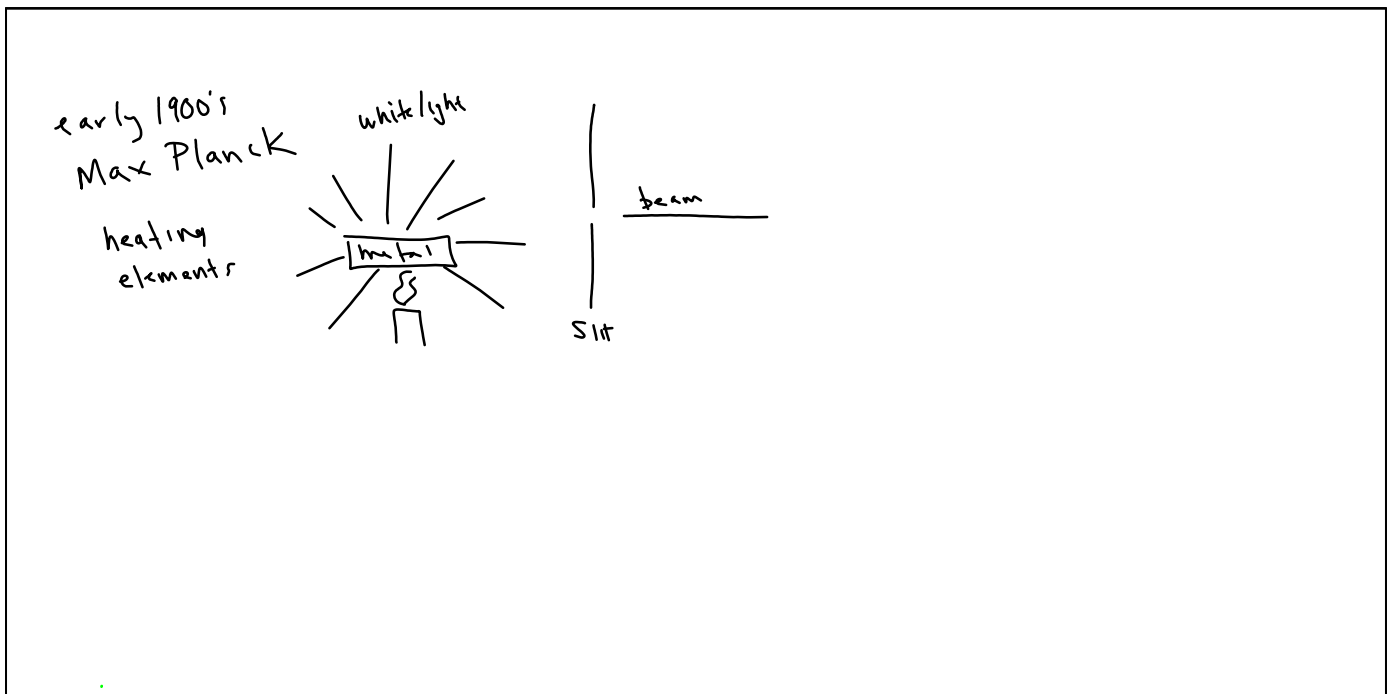
early 1900's
Max Planck

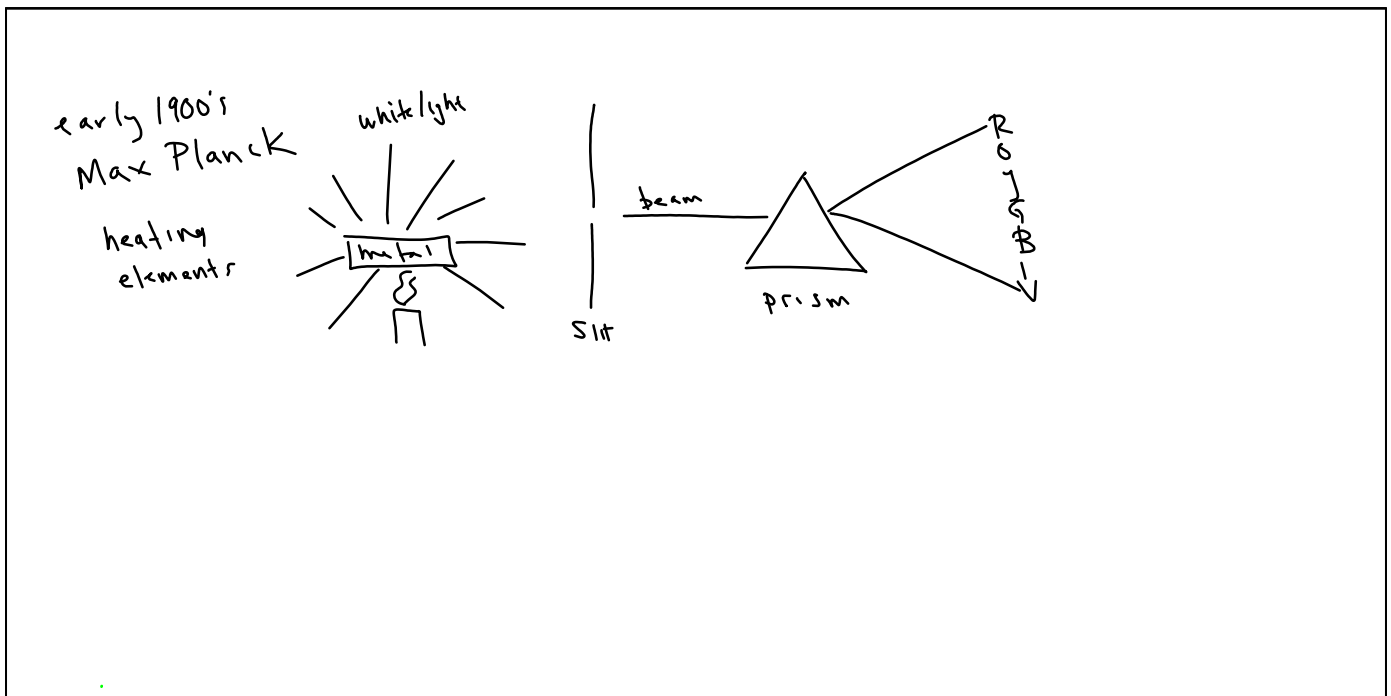
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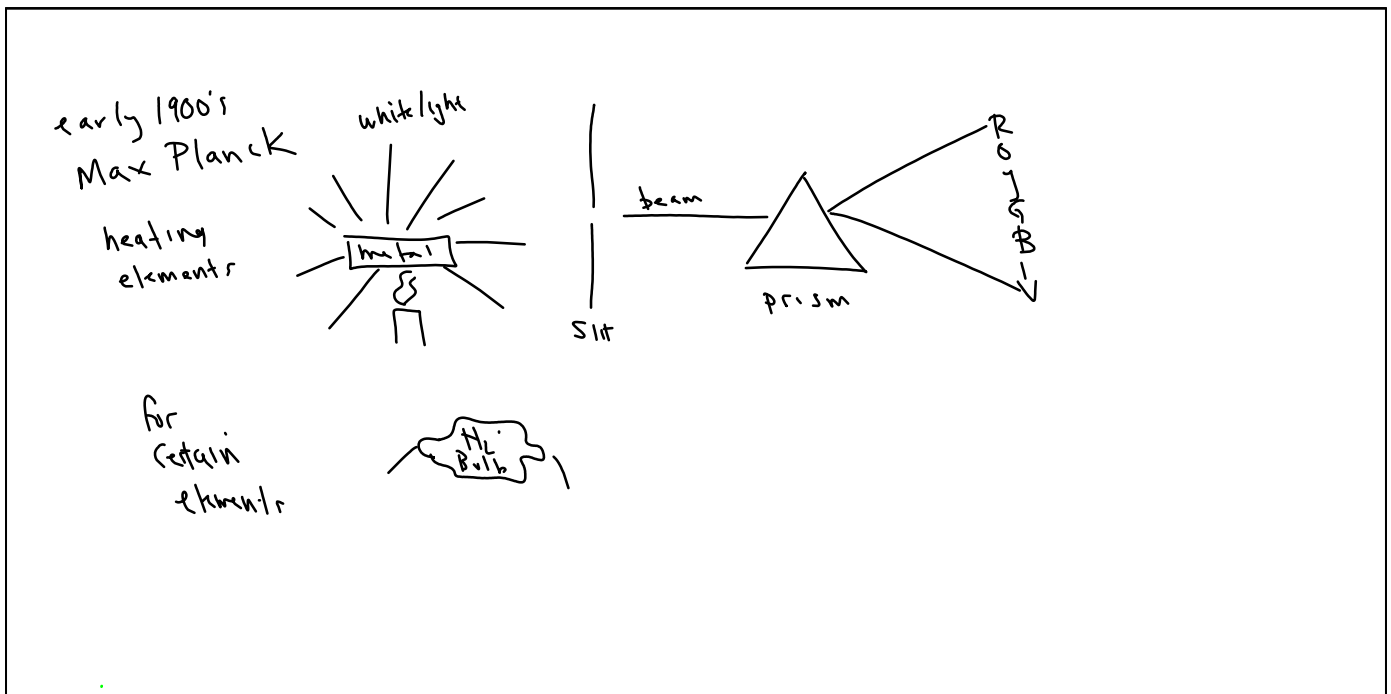
heating
element

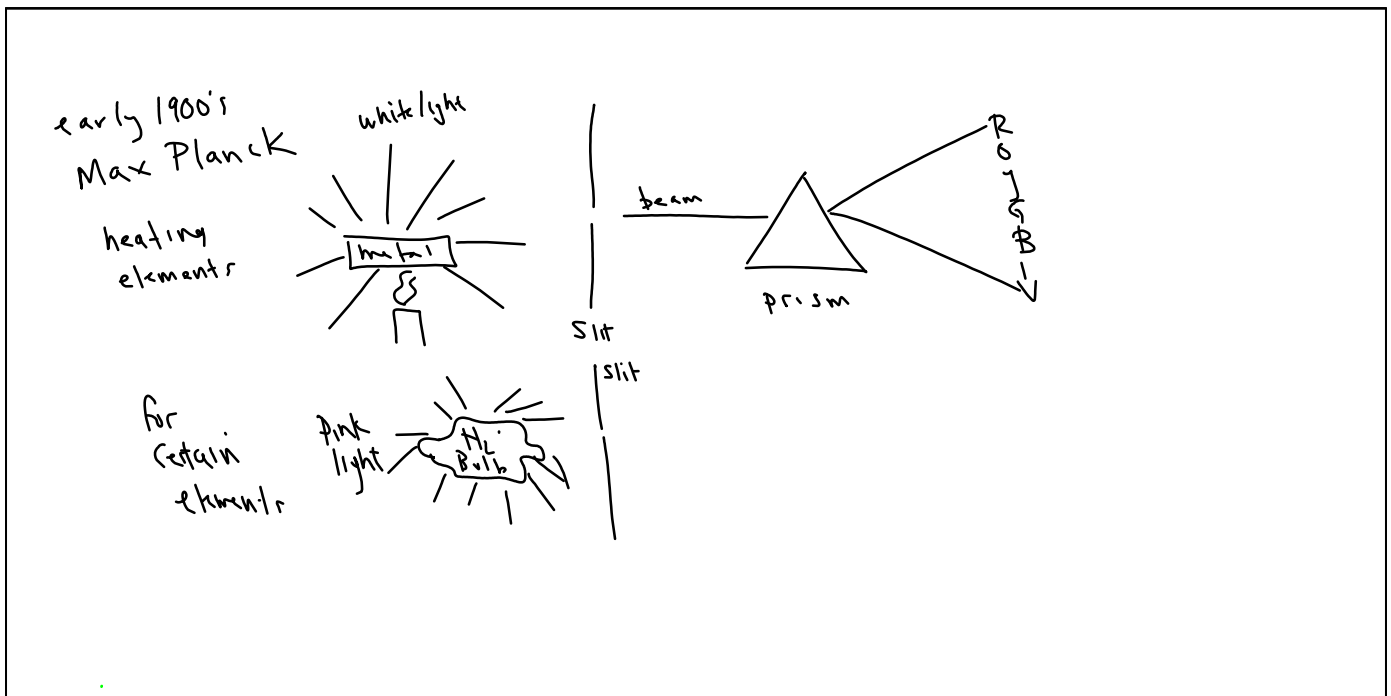


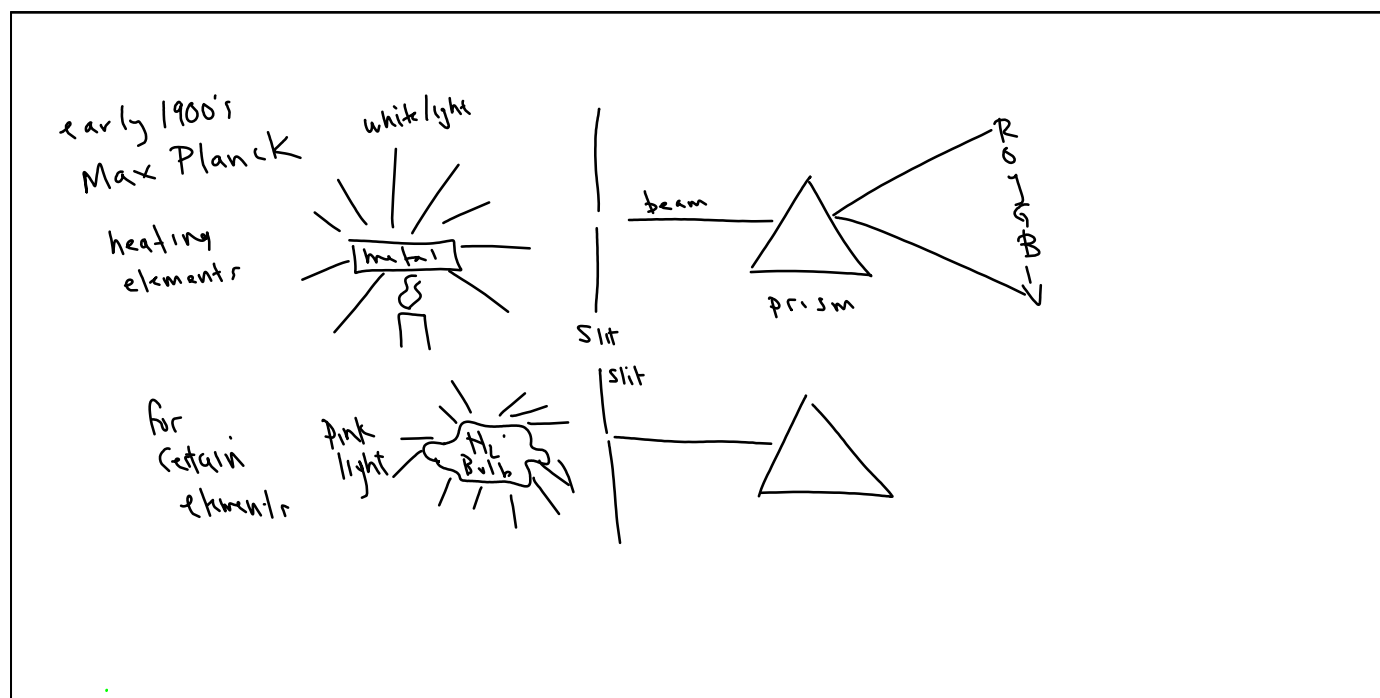


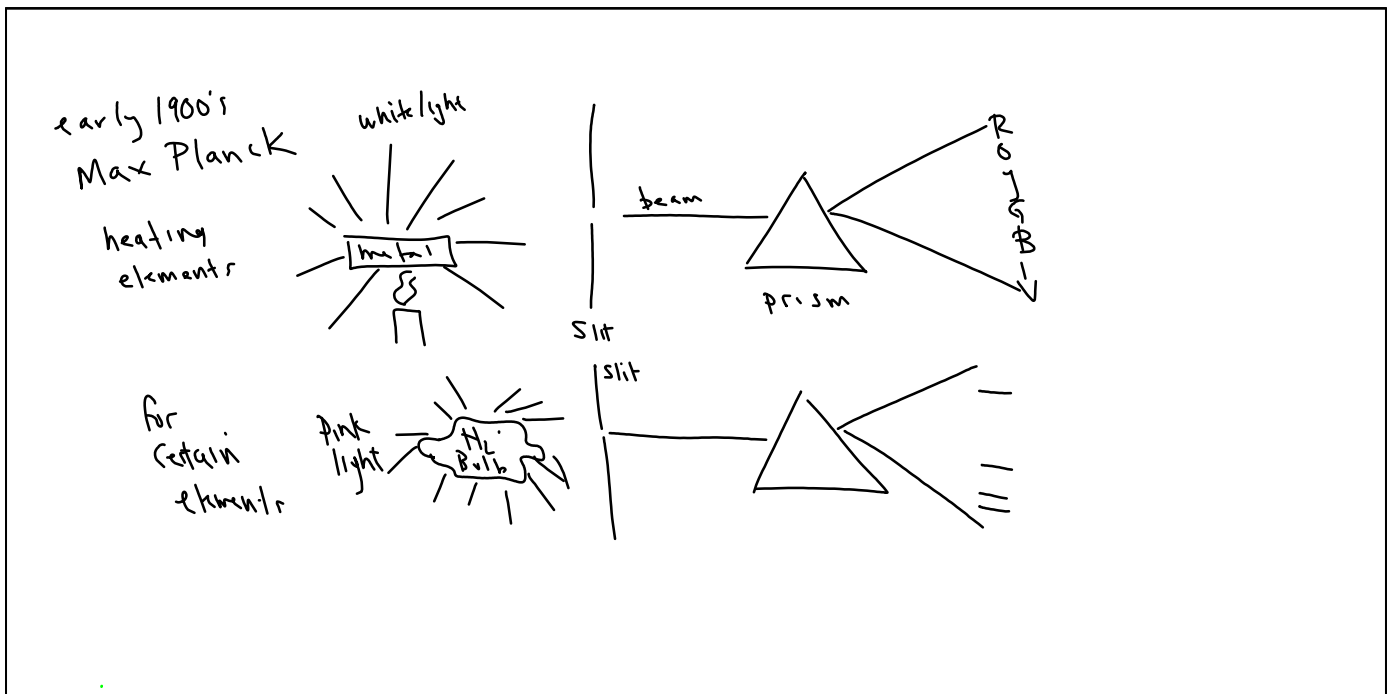


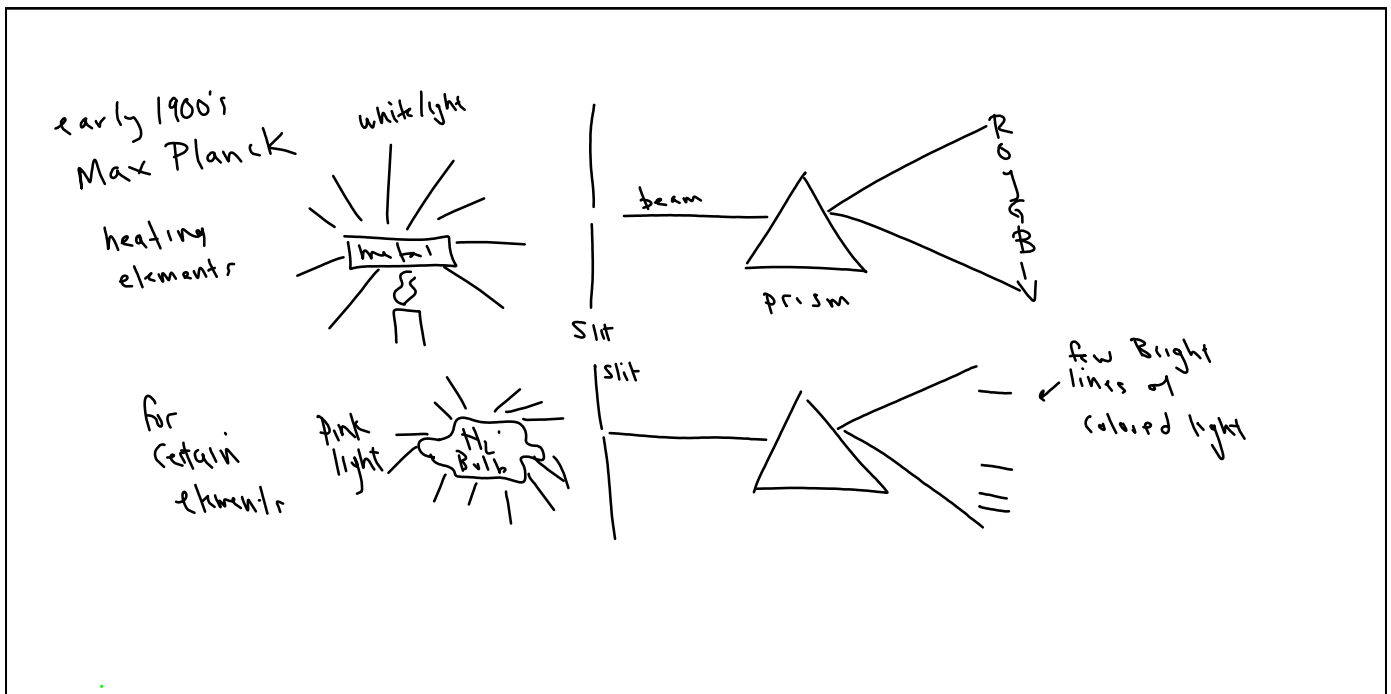


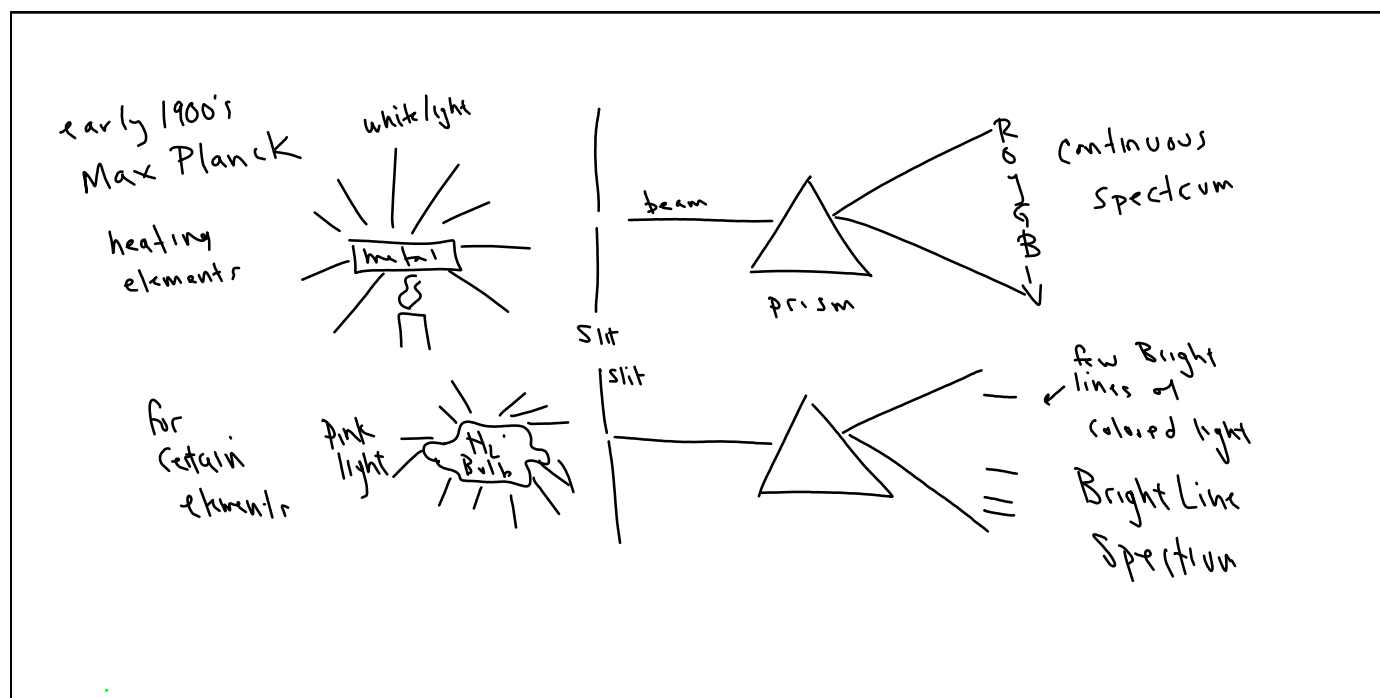












Planck's conclusion

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1. Hot Matter does not lose Energy continuously
↳ losing energy in packets

Planck's conclusion

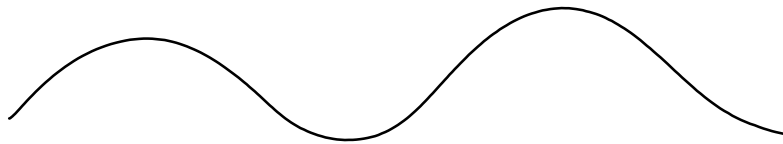
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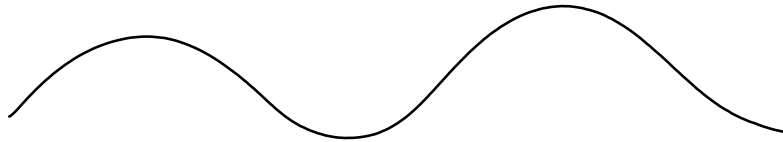
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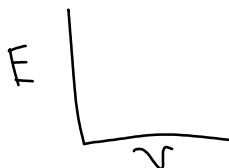
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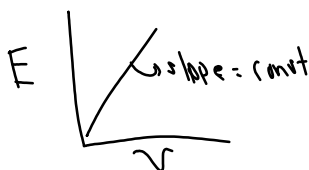
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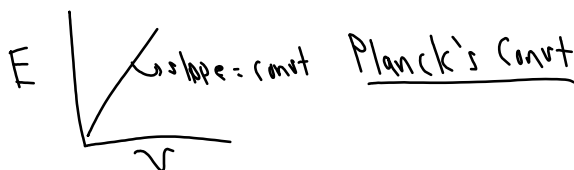
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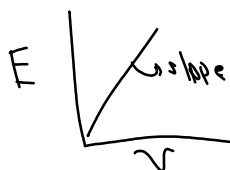
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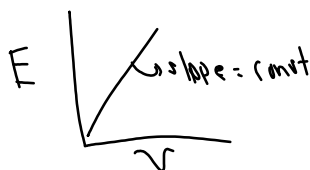


Planck's Const
 $h = 6.62 \times 10^{-34} \text{ J}\cdot\text{s}$

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$$E = h\nu$$



Planck's Const
 $h = 6.62 \times 10^{-34} \text{ J}\cdot\text{s}$

$$E = h\nu \quad h = 6.62 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$c = \lambda \nu \quad c = 3.00 \times 10^8 \frac{\text{m}}{\text{s}}$$

$$\nu = \frac{c}{\lambda}$$

$$\boxed{E = h\nu} \quad h = 6.62 \times 10^{-34} \text{ J}\cdot\text{s}$$

$$\boxed{c = \lambda \cdot \nu} \quad c = 3.00 \times 10^8 \frac{\text{m}}{\text{s}}$$

$$\therefore \frac{c}{\lambda} \rightarrow \boxed{E = \frac{hc}{\lambda}}$$

$$E = h\nu$$

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What are the E & ν 's
of a light wave that is
764 nm?

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Neils Bohr Model of the Atom
1913

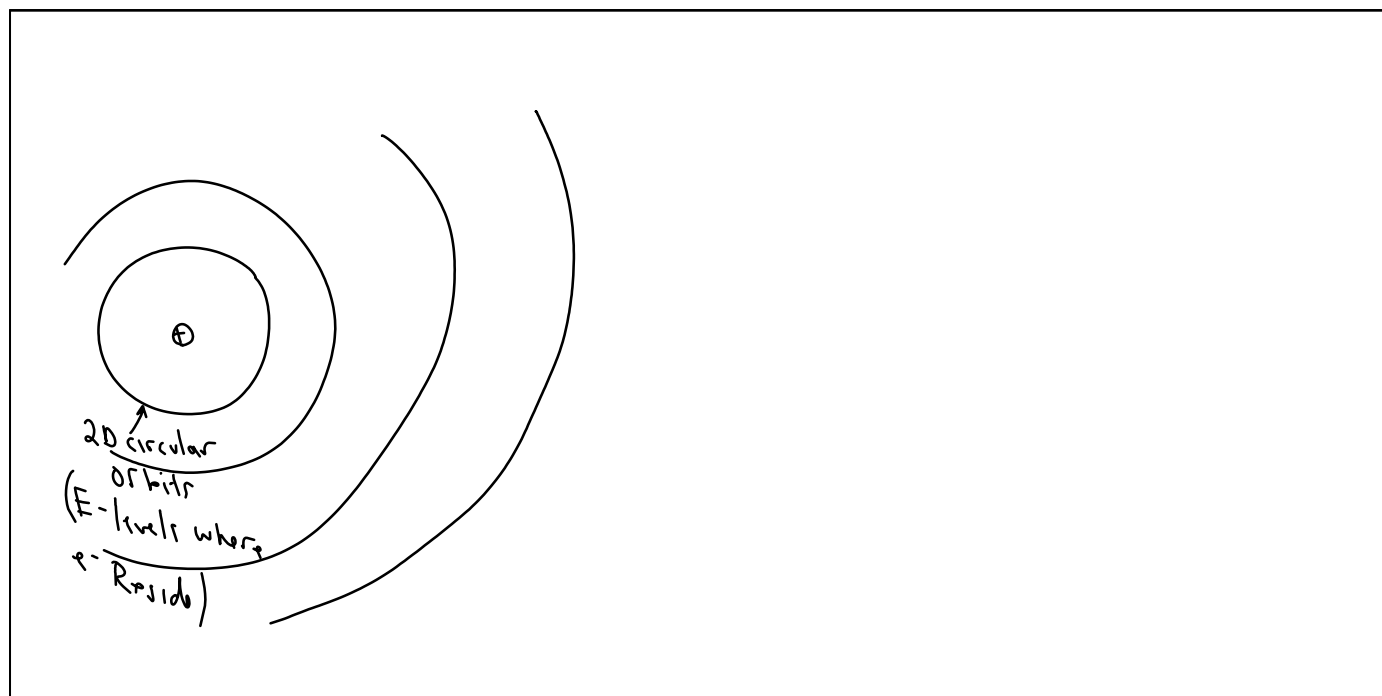
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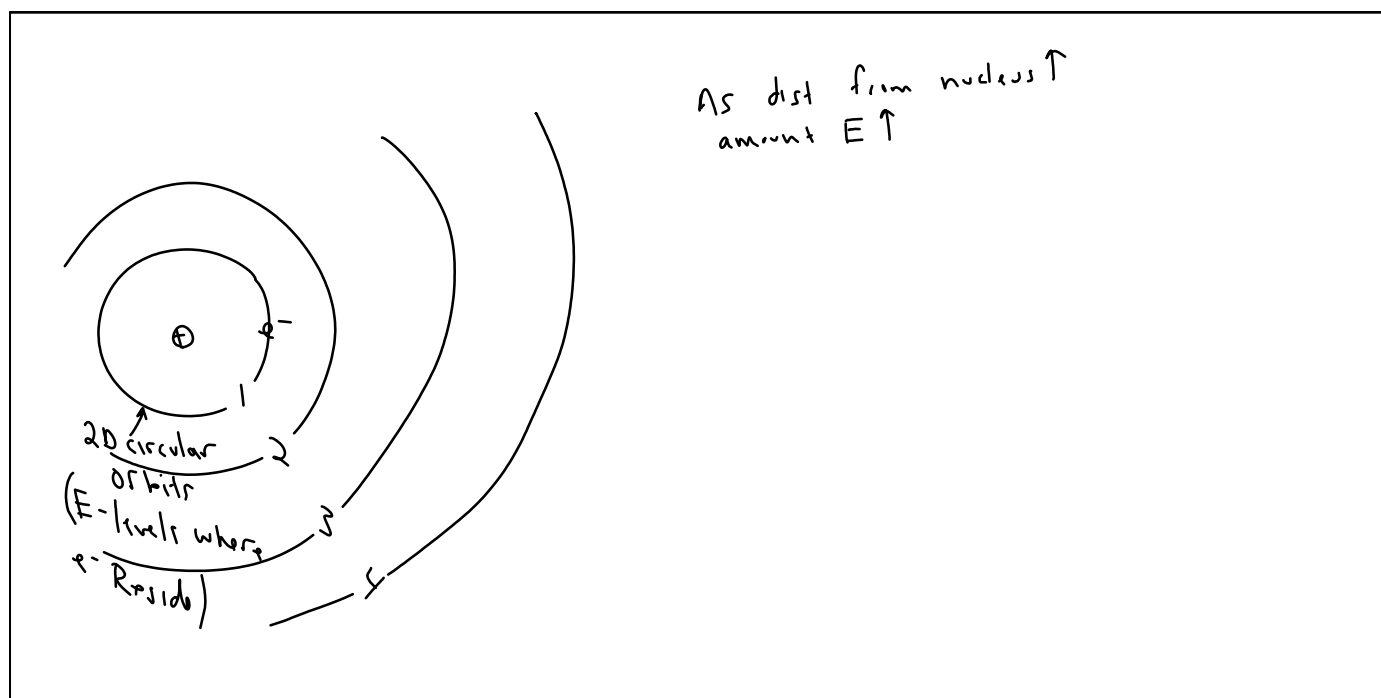
↳ looking @ BL spec of H, Niels realizes that since only certain λ 's of light emitted, the atoms must have only certain amounts of E allowed & thus are Quantized

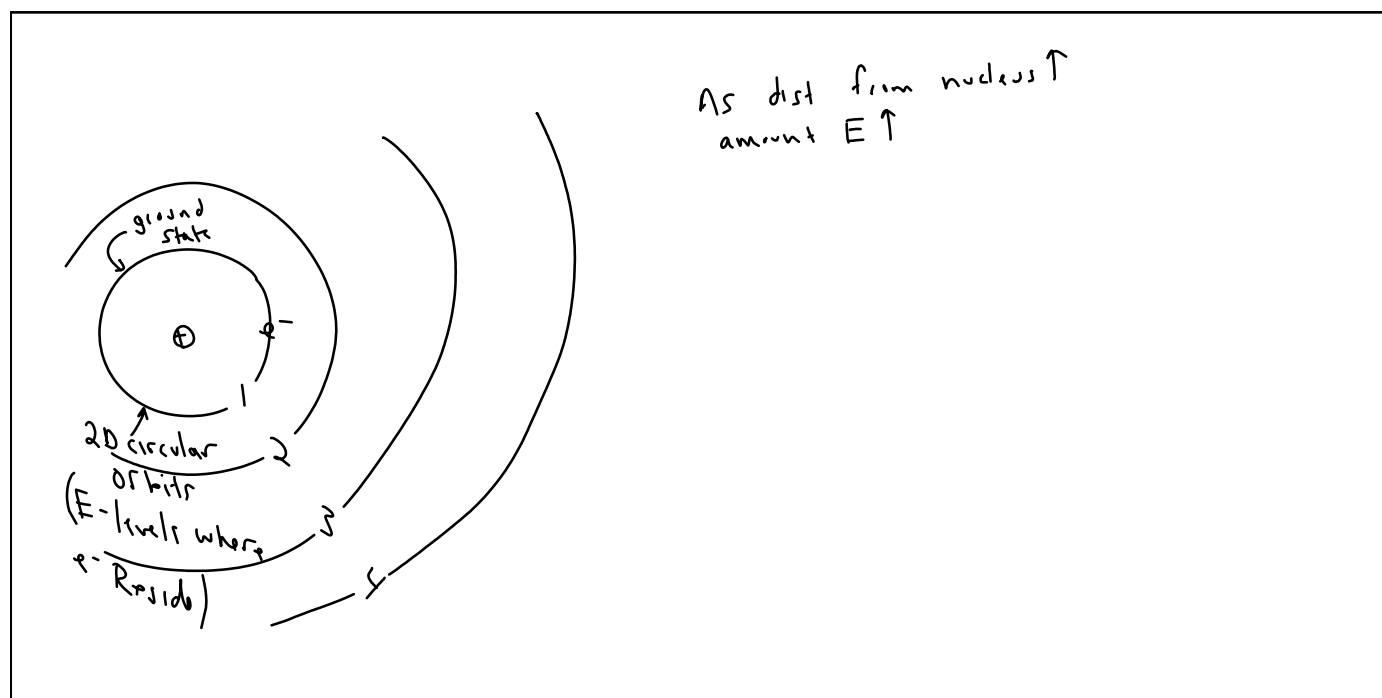
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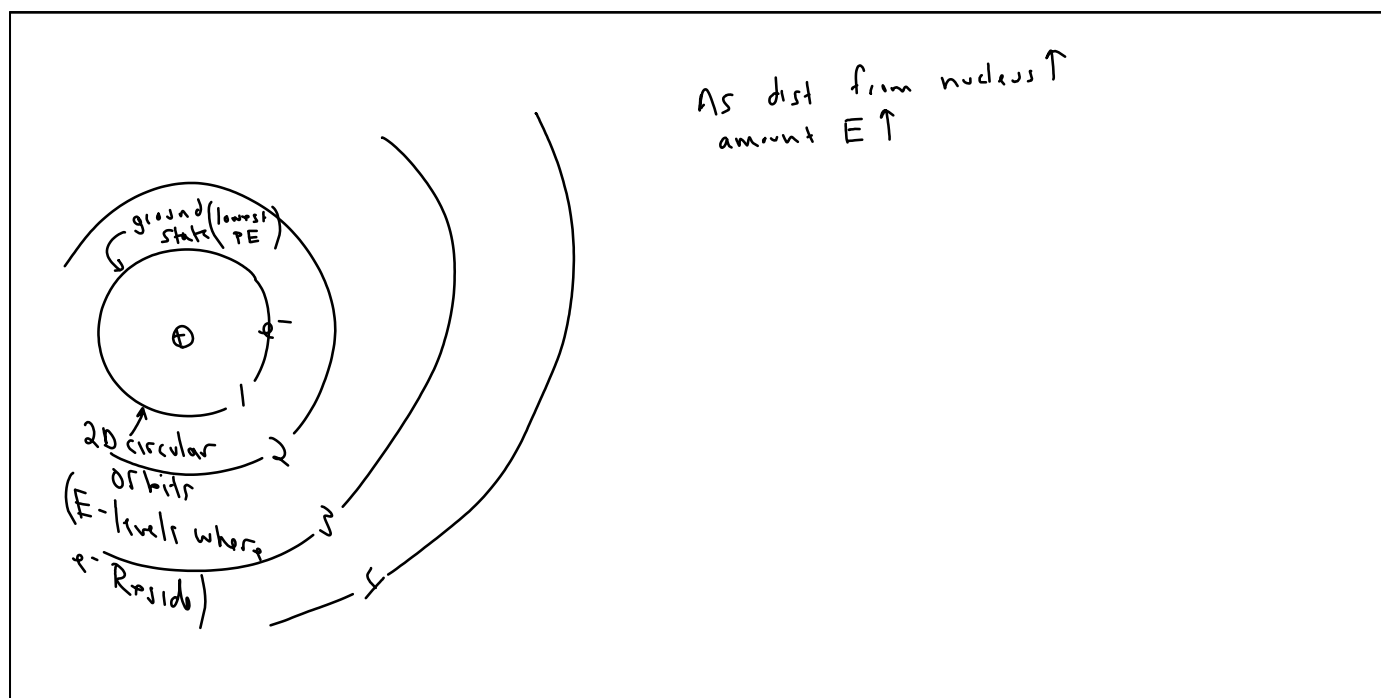
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↳ These E -levels are where the e^- Reside

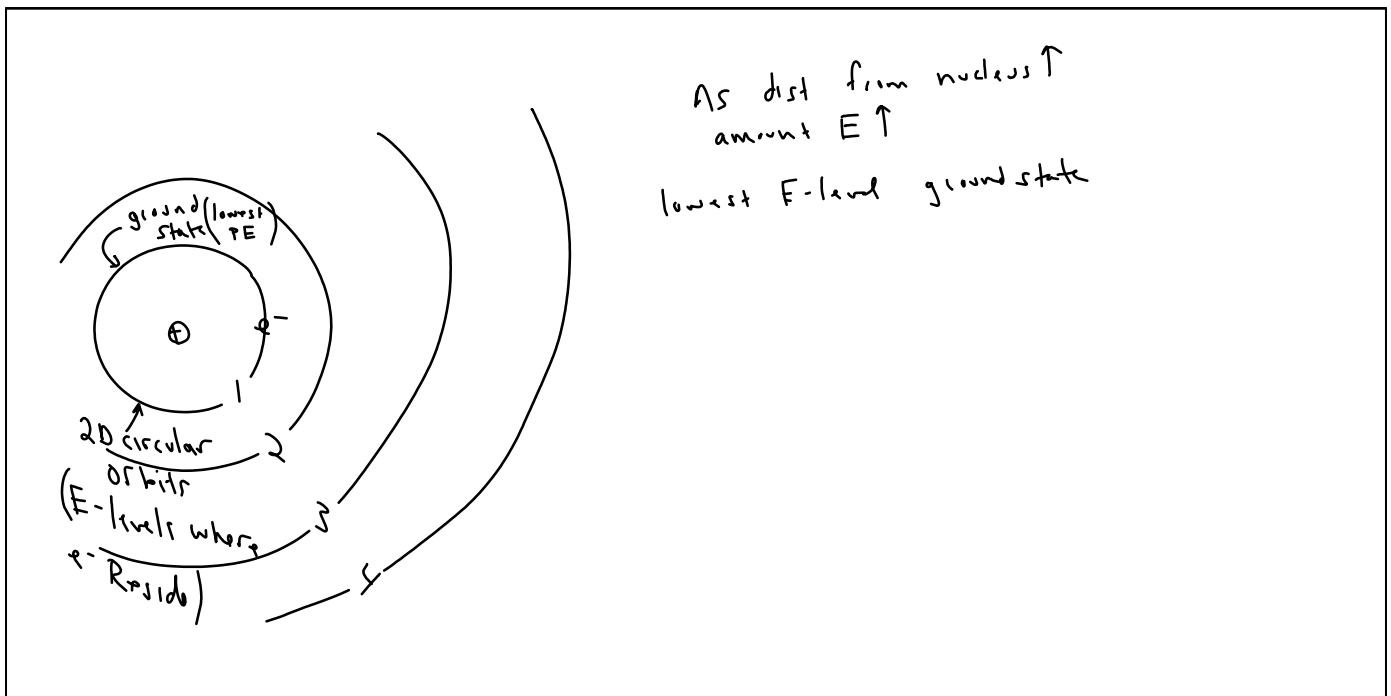


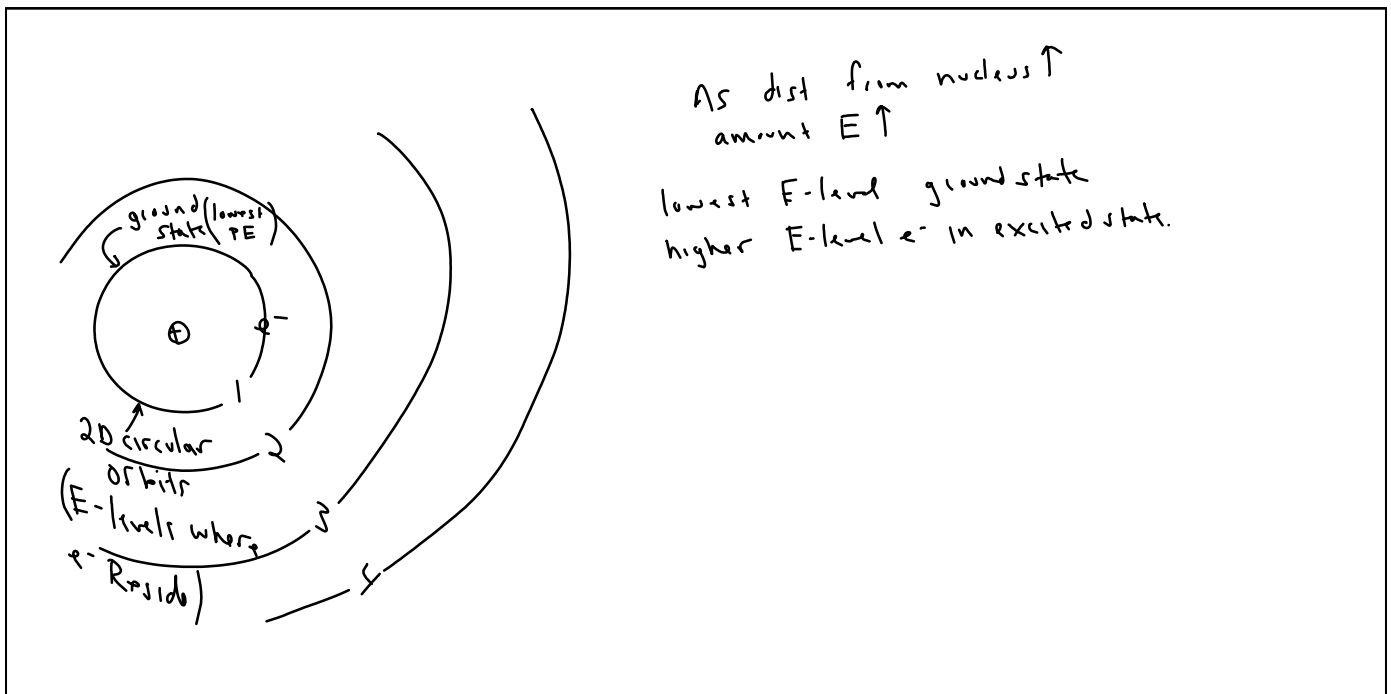




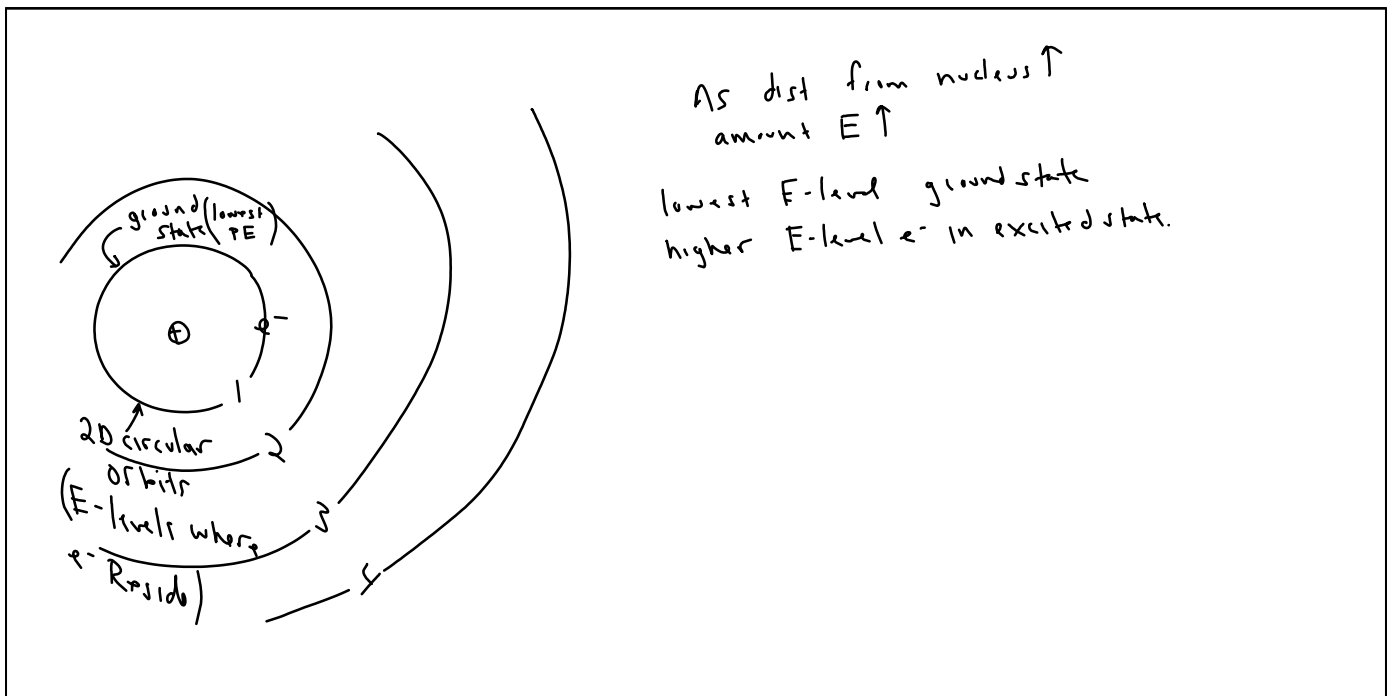


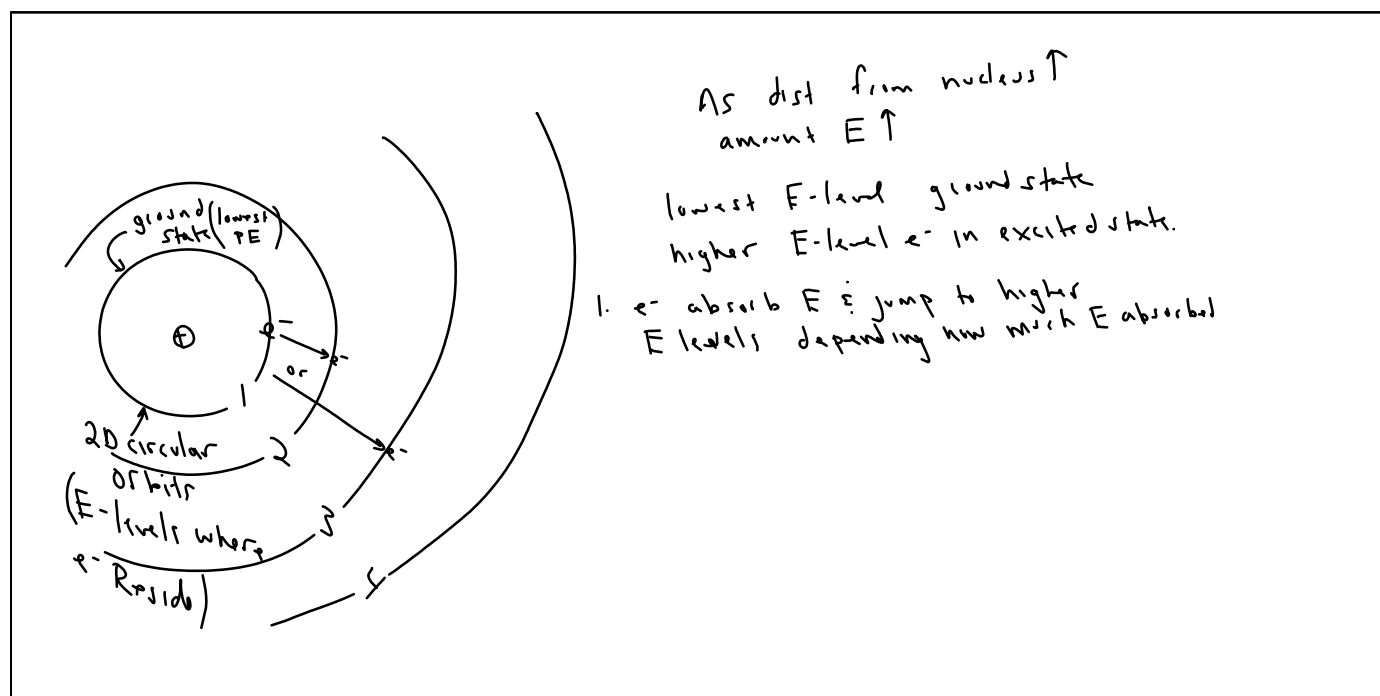
Ch 4 Notes CPA D Block.ink

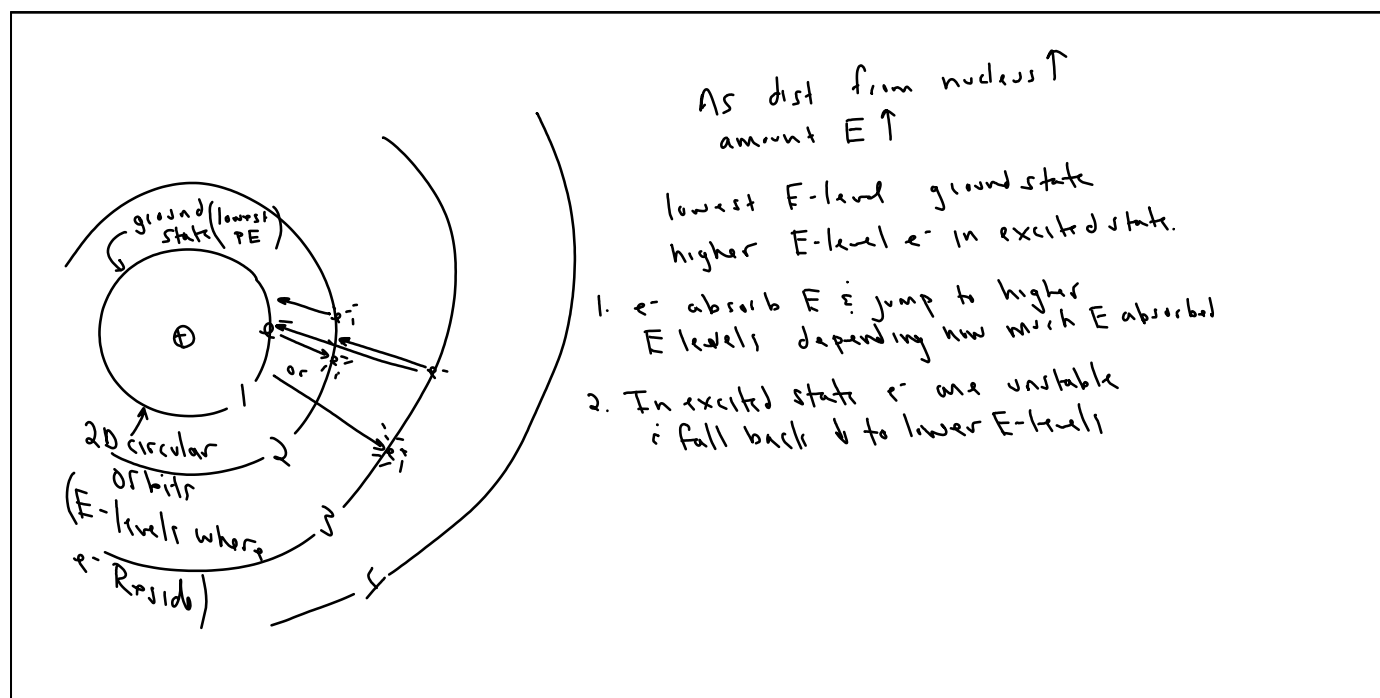




Ch 4 Notes CPA D Block.ink







As dist from nucleus \uparrow
amount $E \uparrow$

lowest E -level ground state
higher E -level e^- in excited state.

1. e^- absorb E & jump to higher E levels depending how much E absorbed
2. In excited state e^- are unstable & fall back to lower E -levels
3. as e^- fall they Release E (LE) As light.

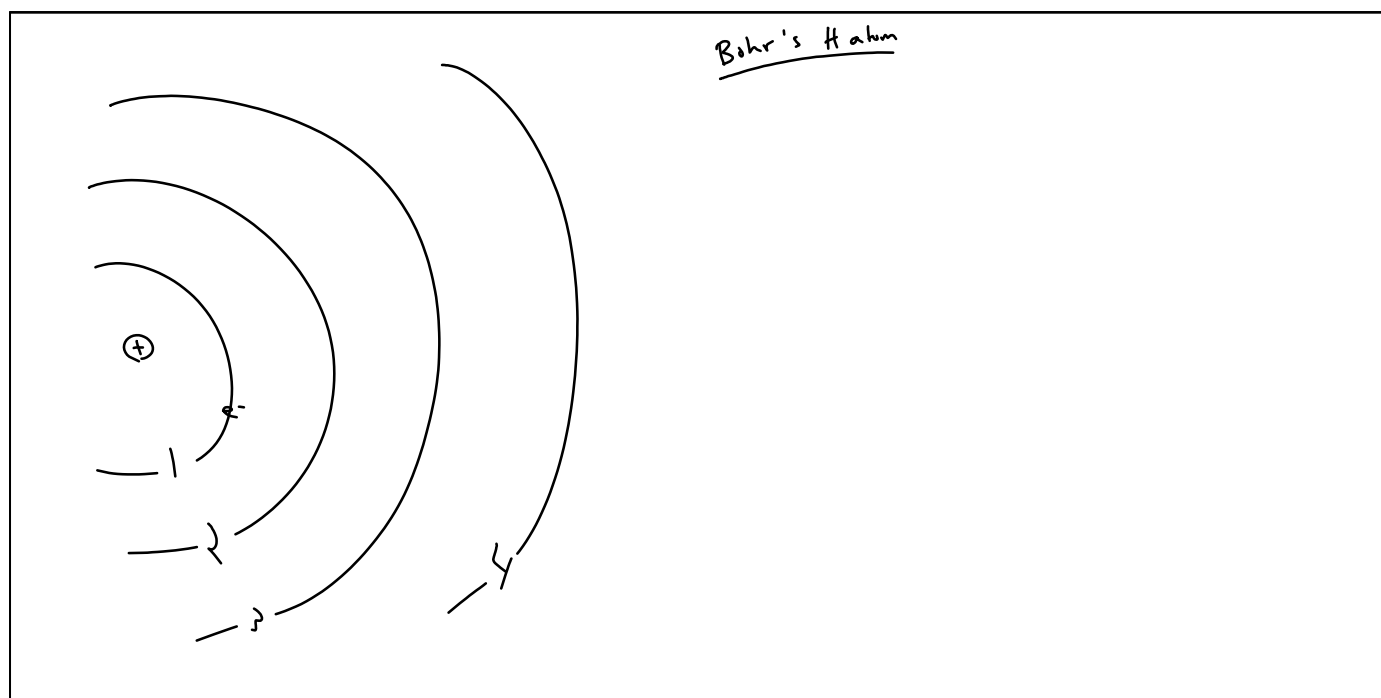
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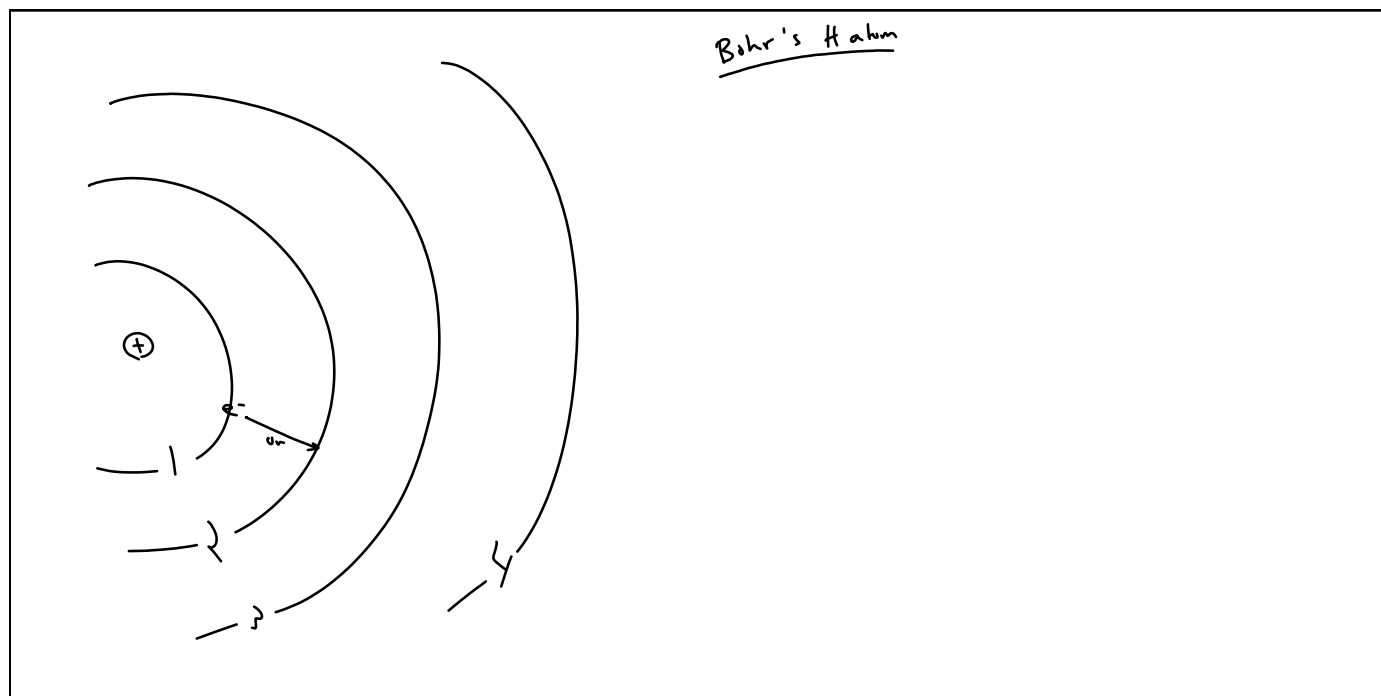
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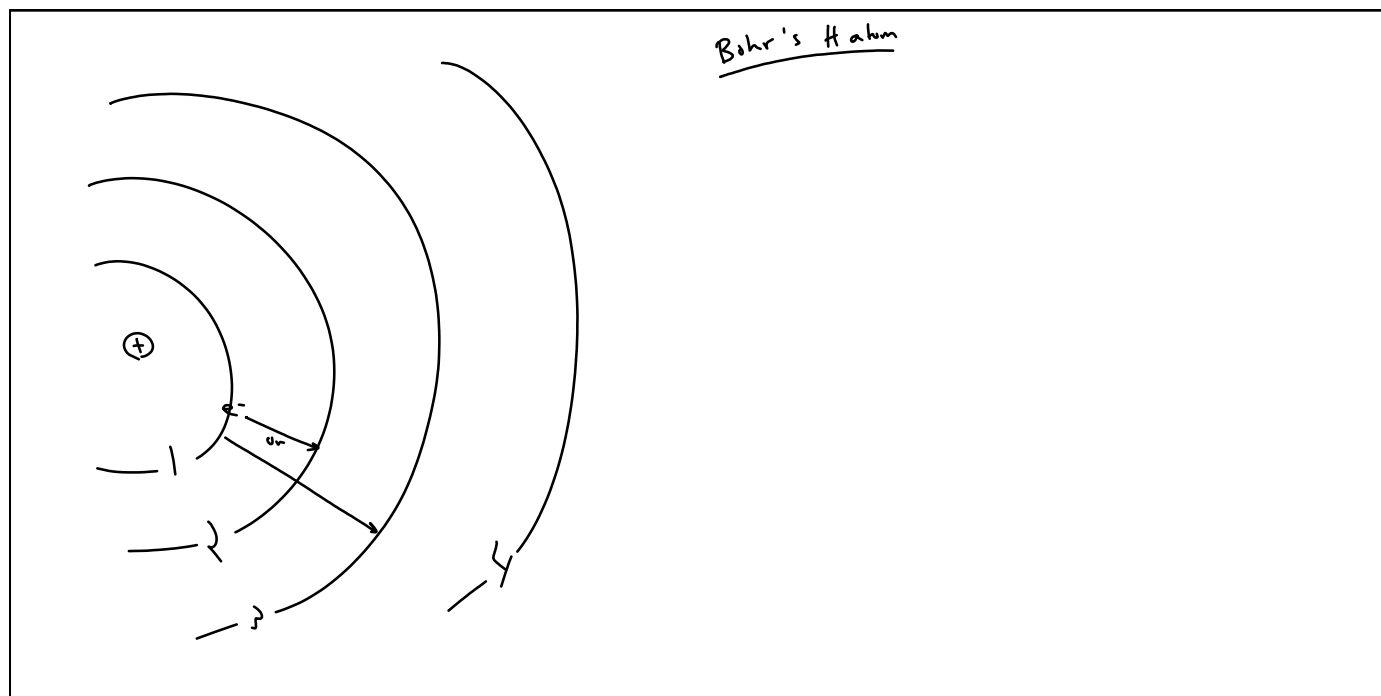
1. e^- absorb E & jump to higher E levels depending how much E absorbed
2. In excited state e^- are unstable & fall back to lower E -levels
3. as e^- fall they Release E (LE) As light. depending on where the e^- falls from gives different lines in BL spec

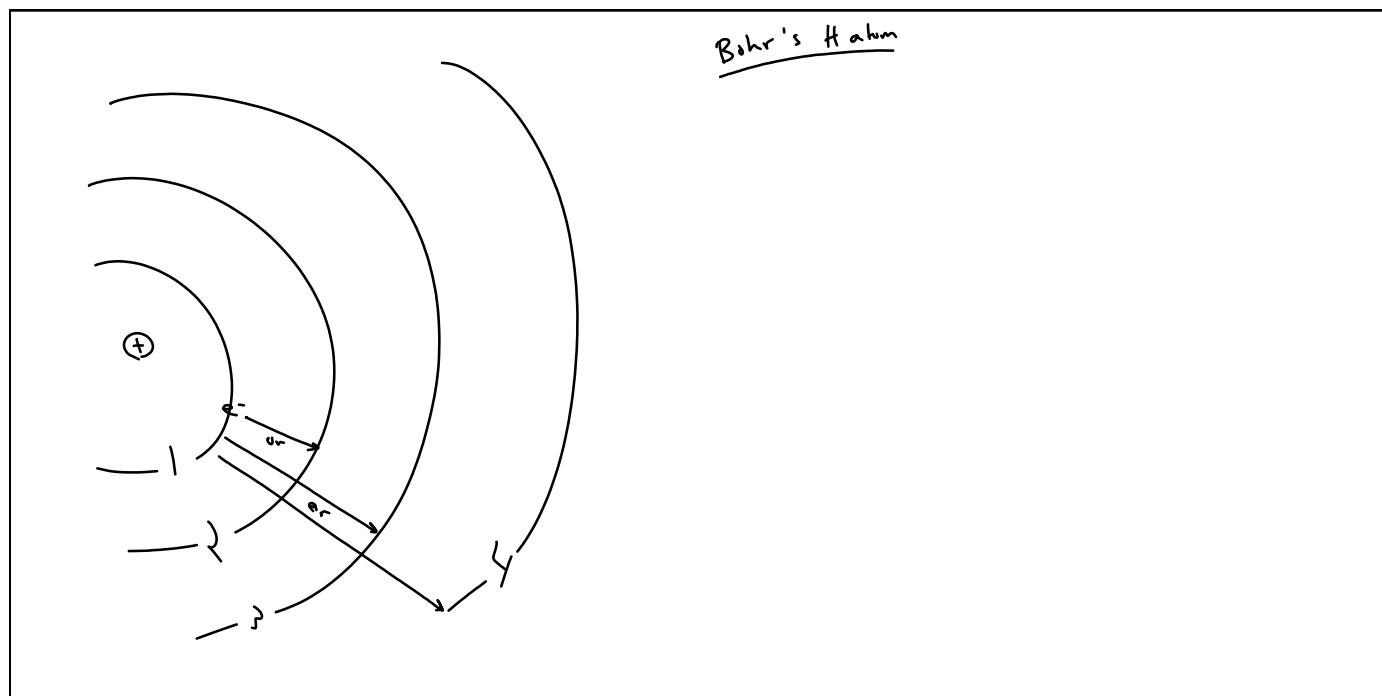
ground (lowest) state (PE)

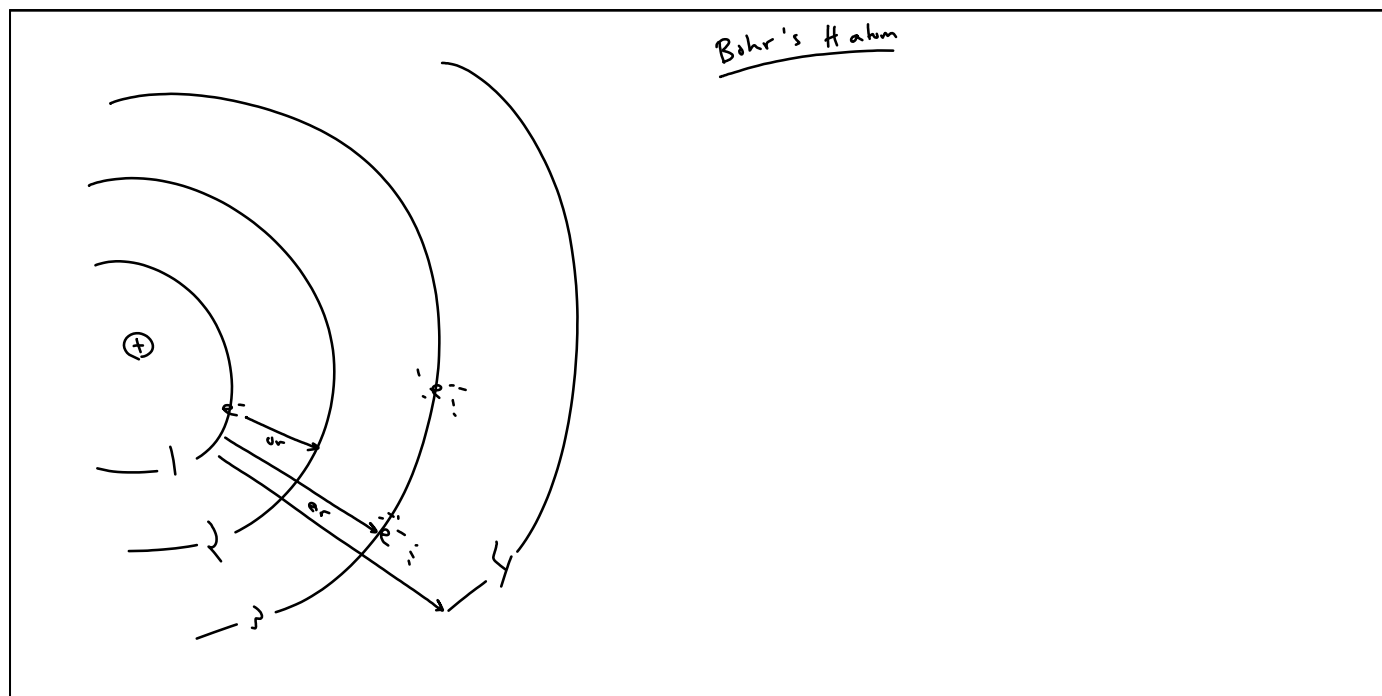
2D circular orbits (E-levels where e^- reside)

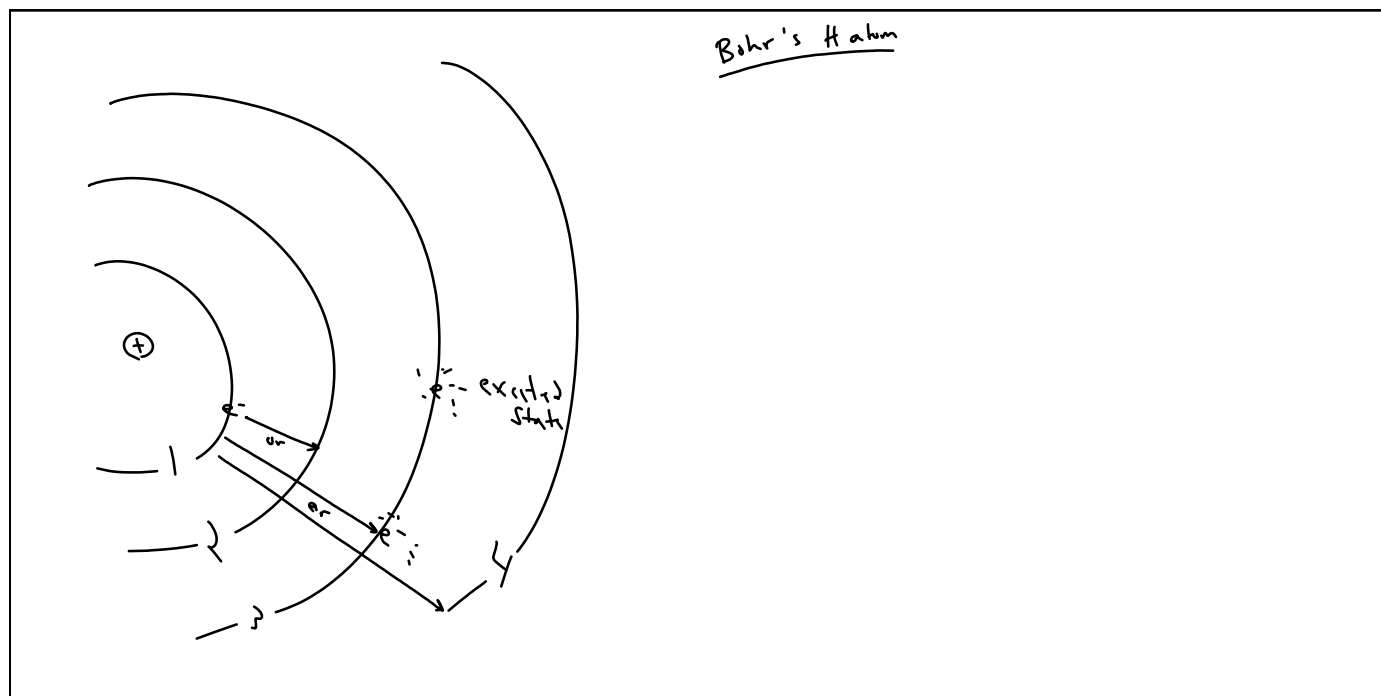


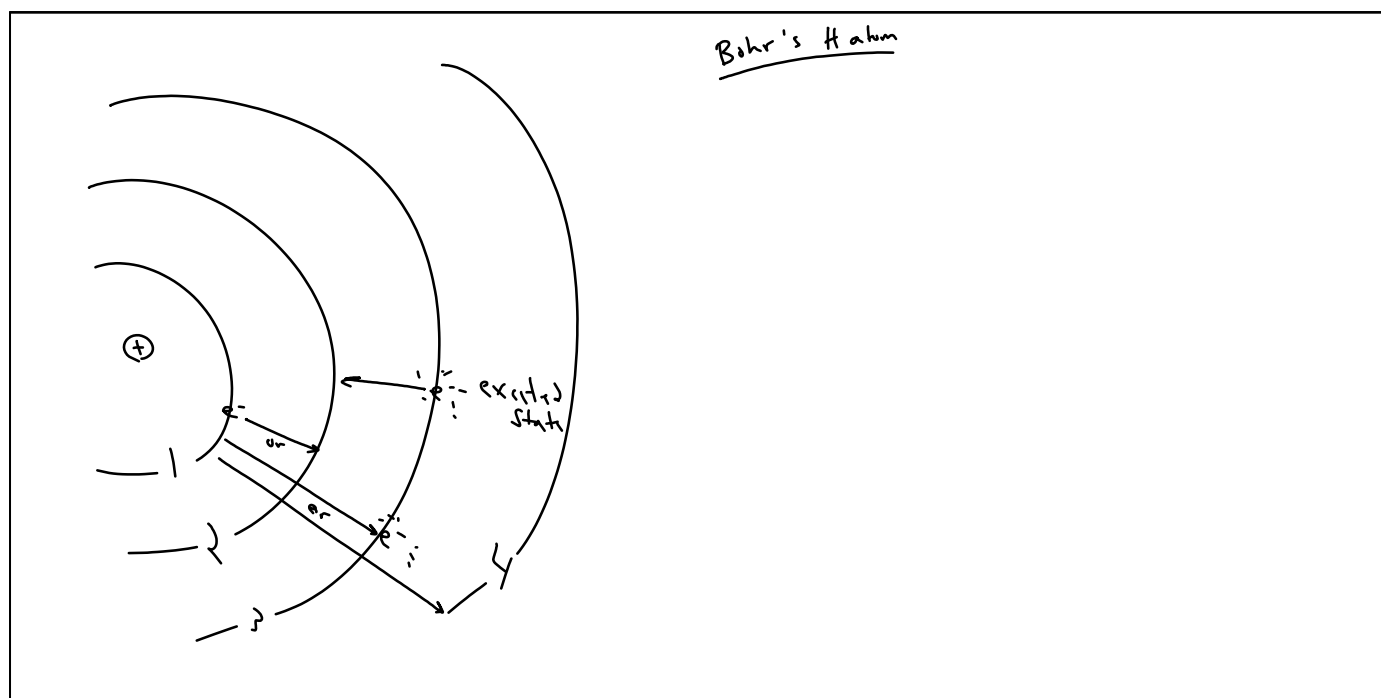


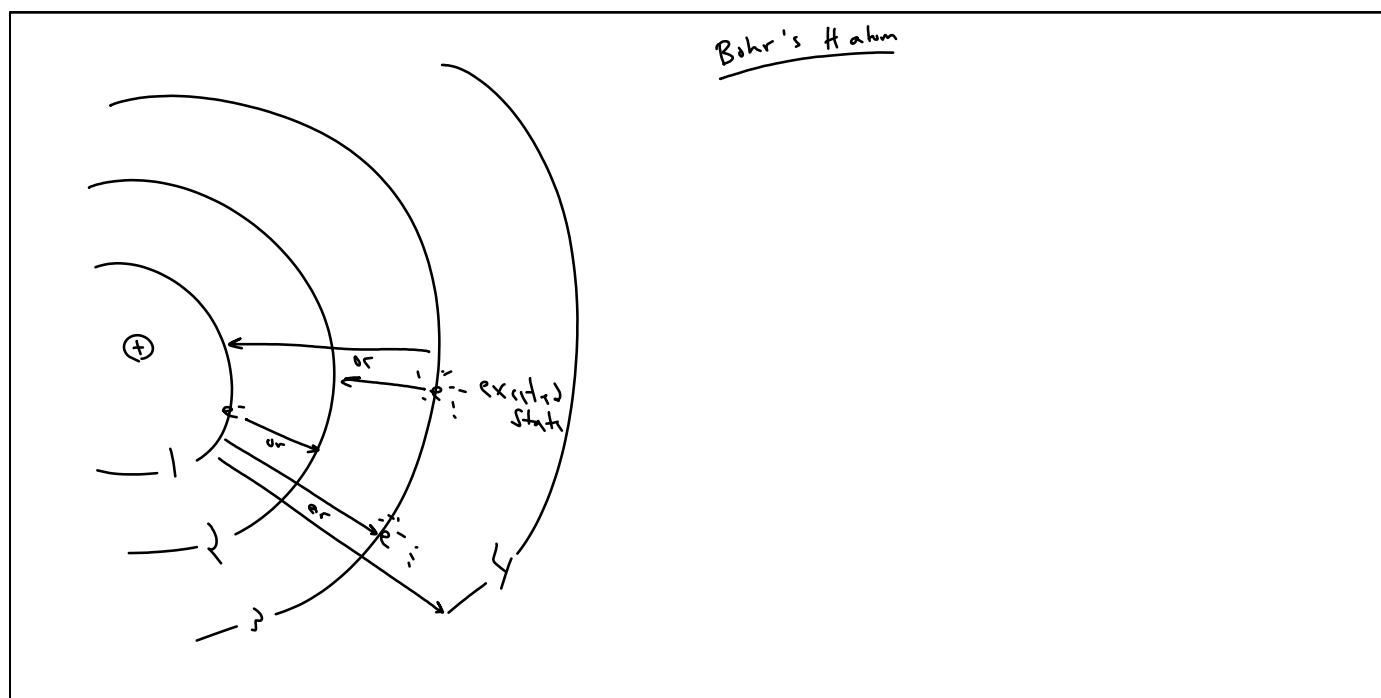


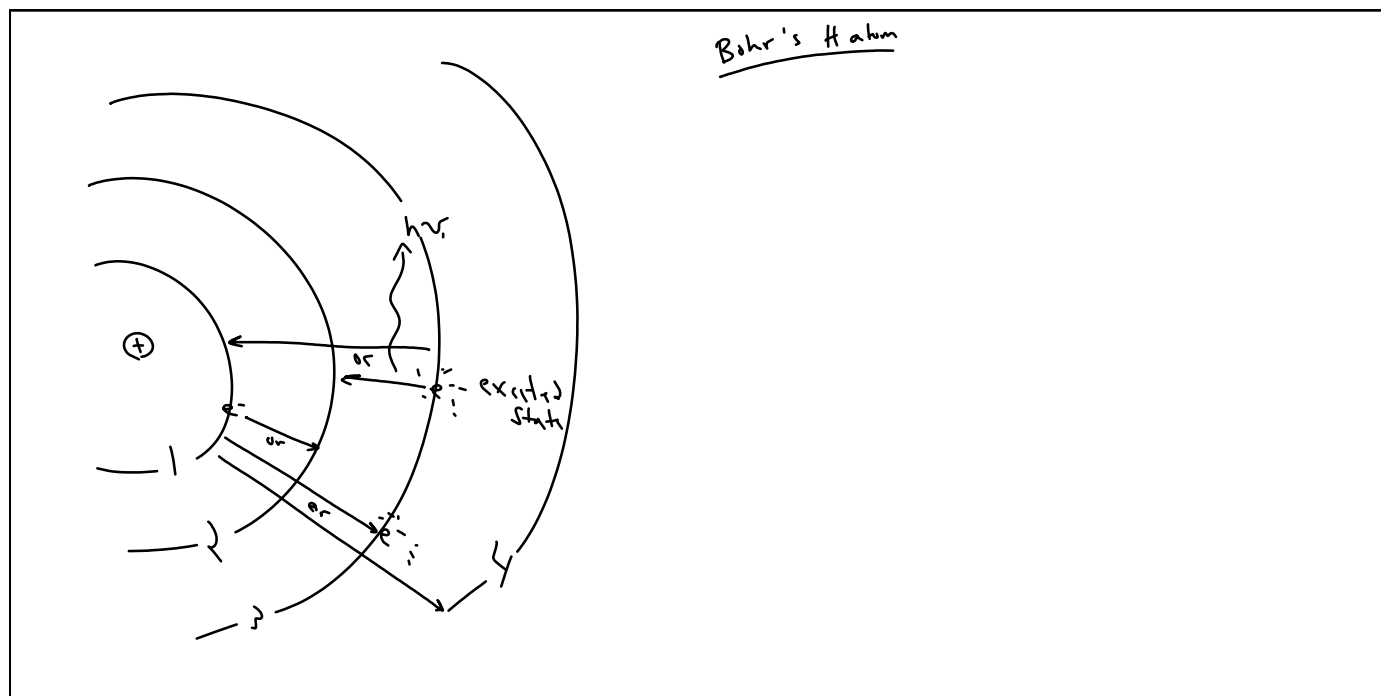


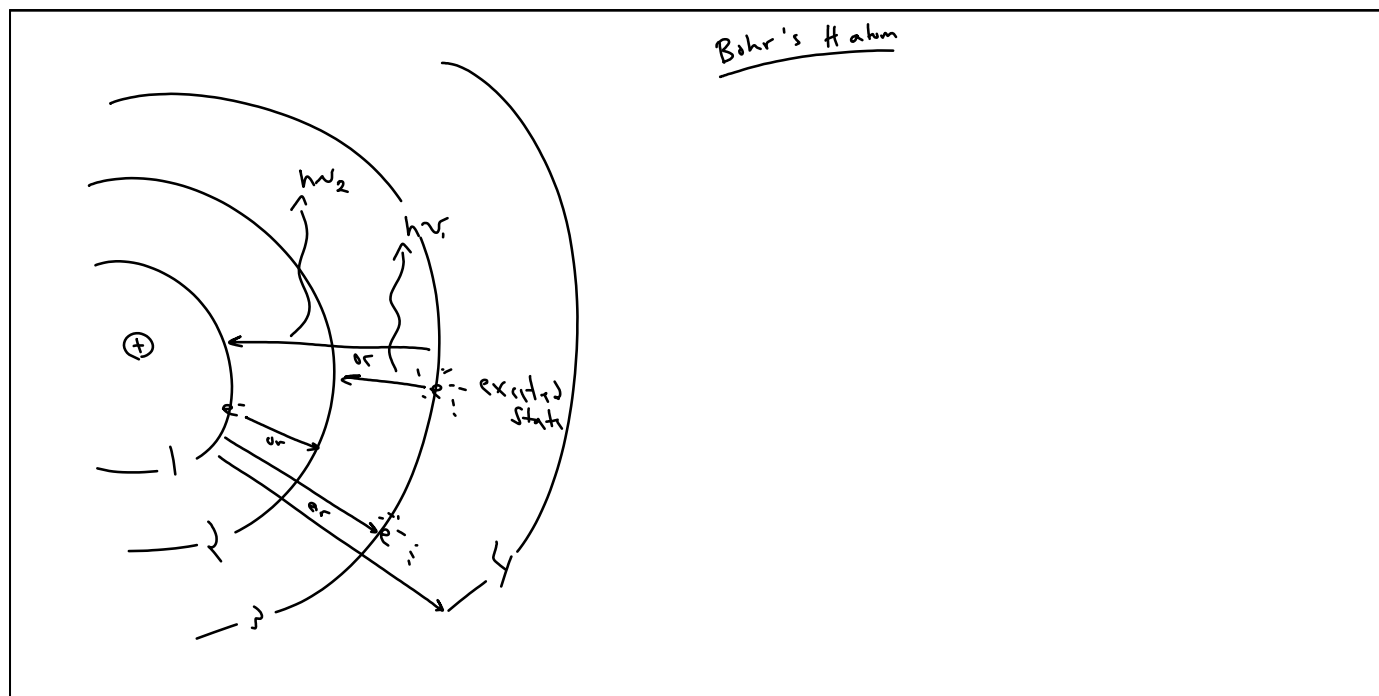


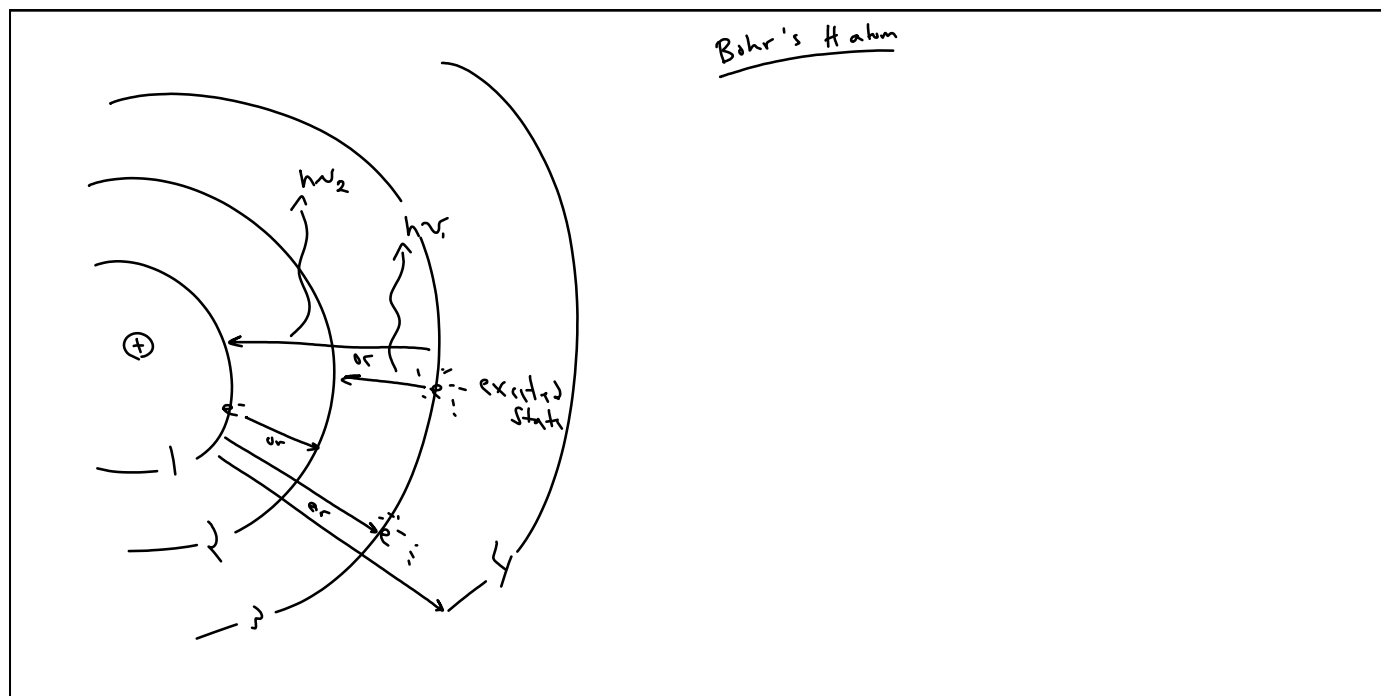


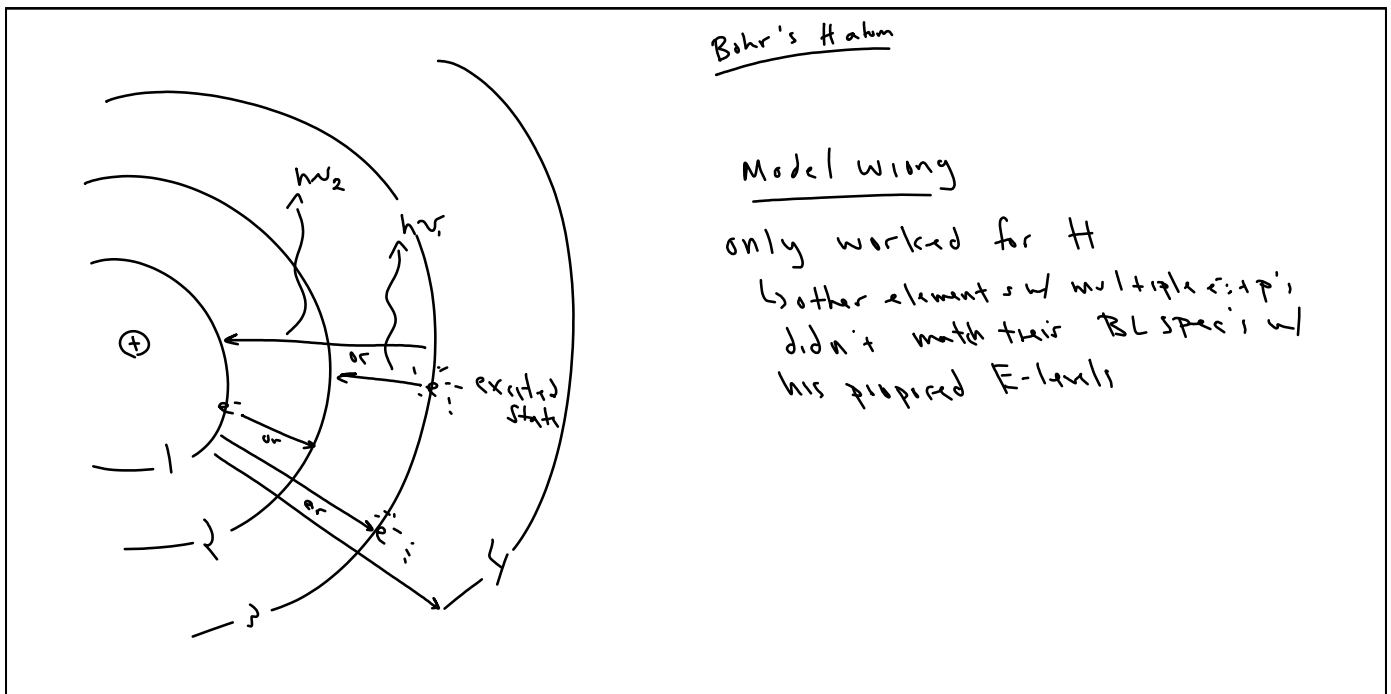


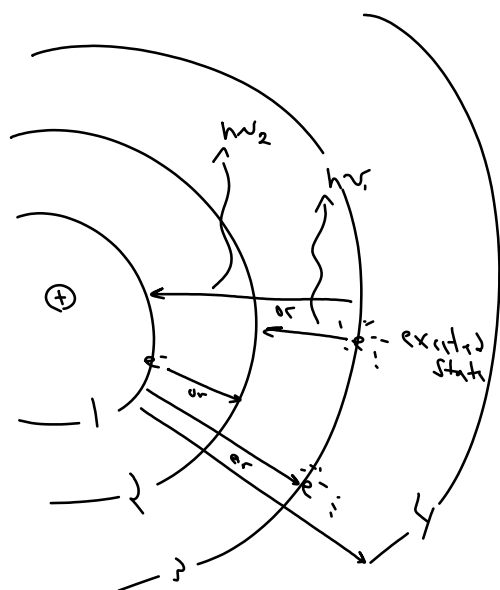












Bohr's Atom

Model wrong

only worked for H
↳ other elements w/ multiple e's + p's
didn't match their BL spec's w/
his proposed E-levels

Didn't explain Reactivity

1923 Louis de Broglie

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↳ suggested that e^- behave like waves!

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moving particle (e^-), w/ mass (m)
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$$\frac{hc}{\lambda} = mc^2 \rightarrow \boxed{\lambda = \frac{h}{mc}} \rightarrow \text{when you do calc's } e^- \text{ have } \lambda \text{ is } 10^{-11} \rightarrow (\sim \text{X Rays} / \gamma\text{-Rays})$$

Suggests that any moving particle (e^-), w/ mass (m) has a λ

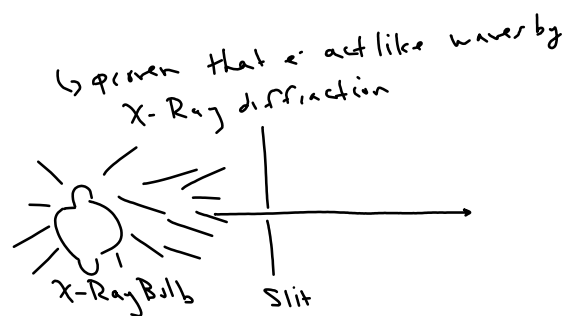
↳ proven that e^- act like waves by
X-Ray diffraction

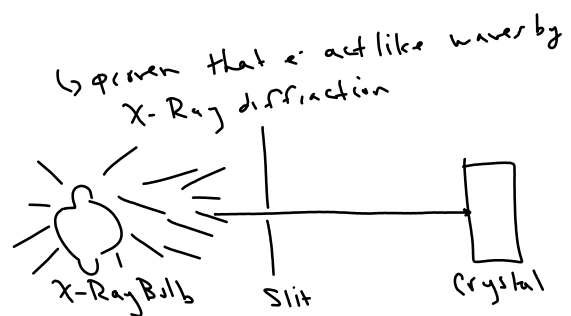
Ch 4 Notes CPA D Block.ink

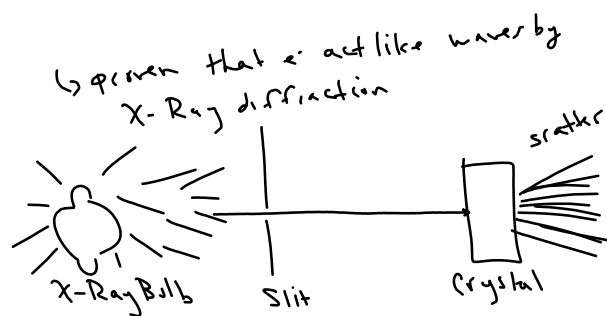
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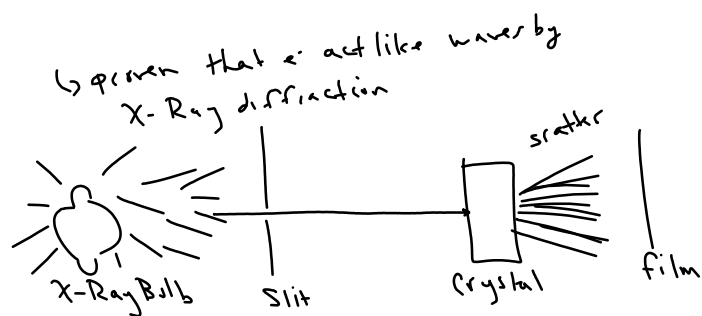


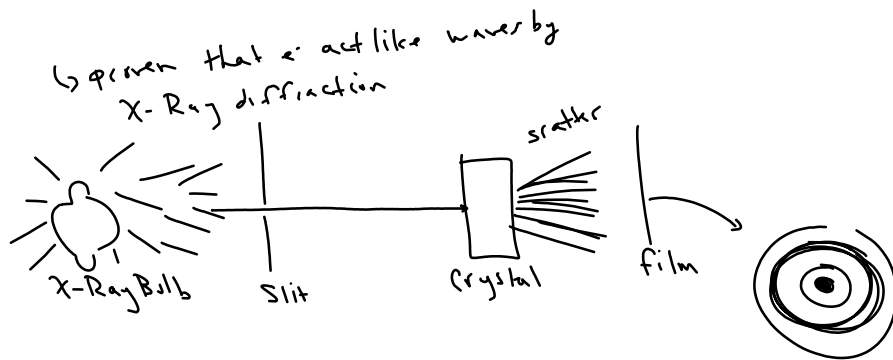
X-Ray Bulb

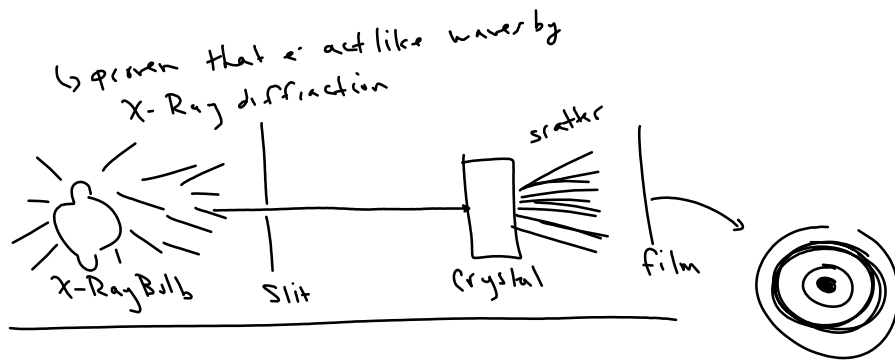


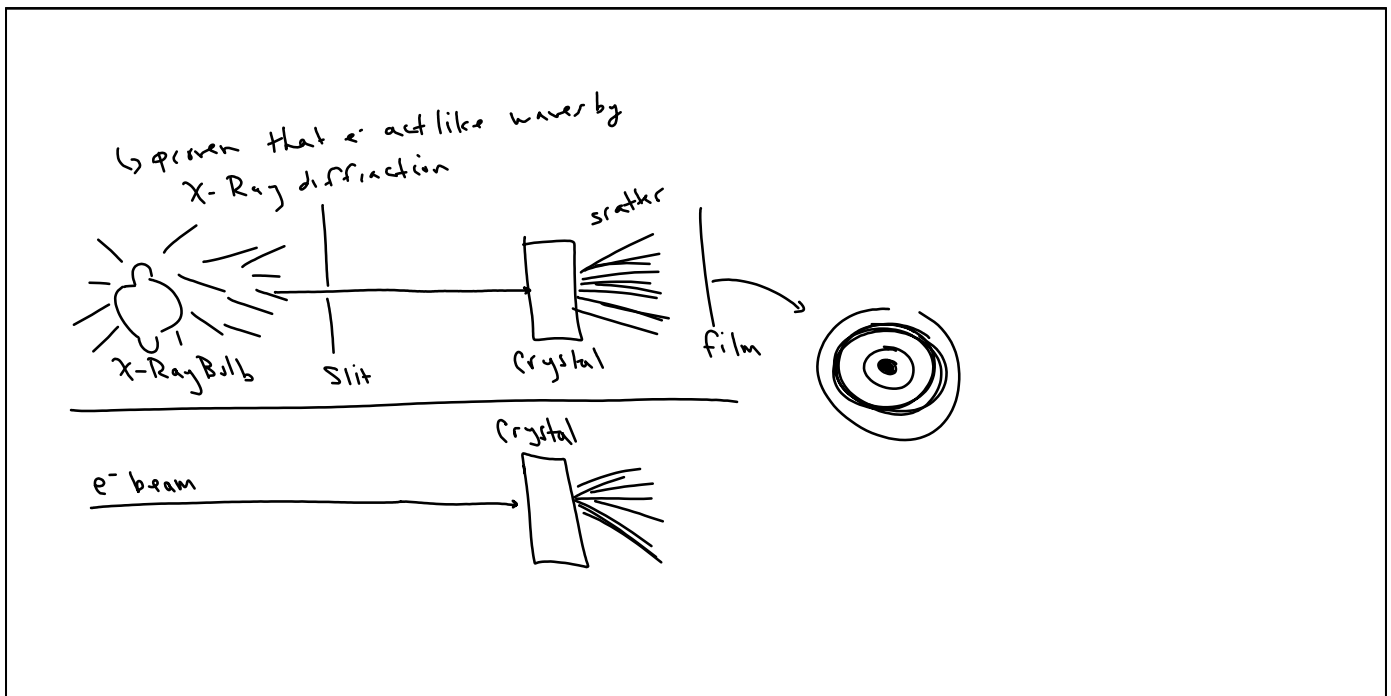


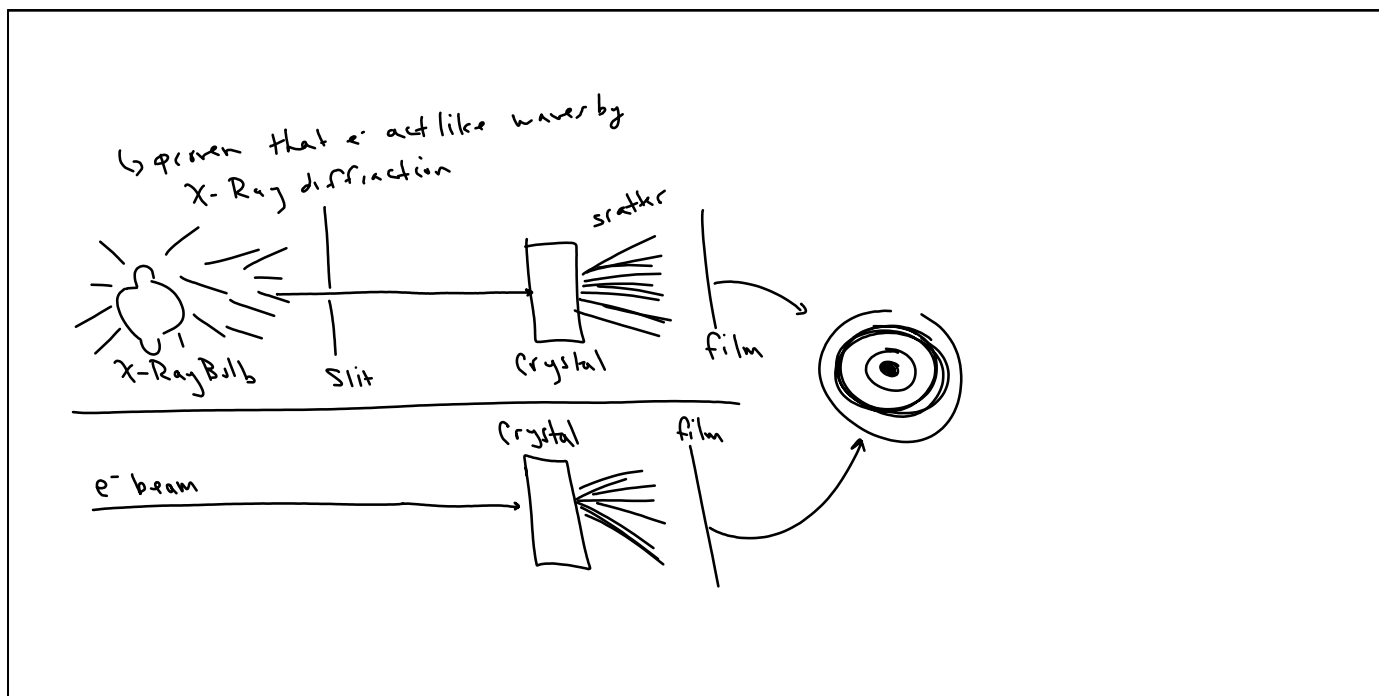


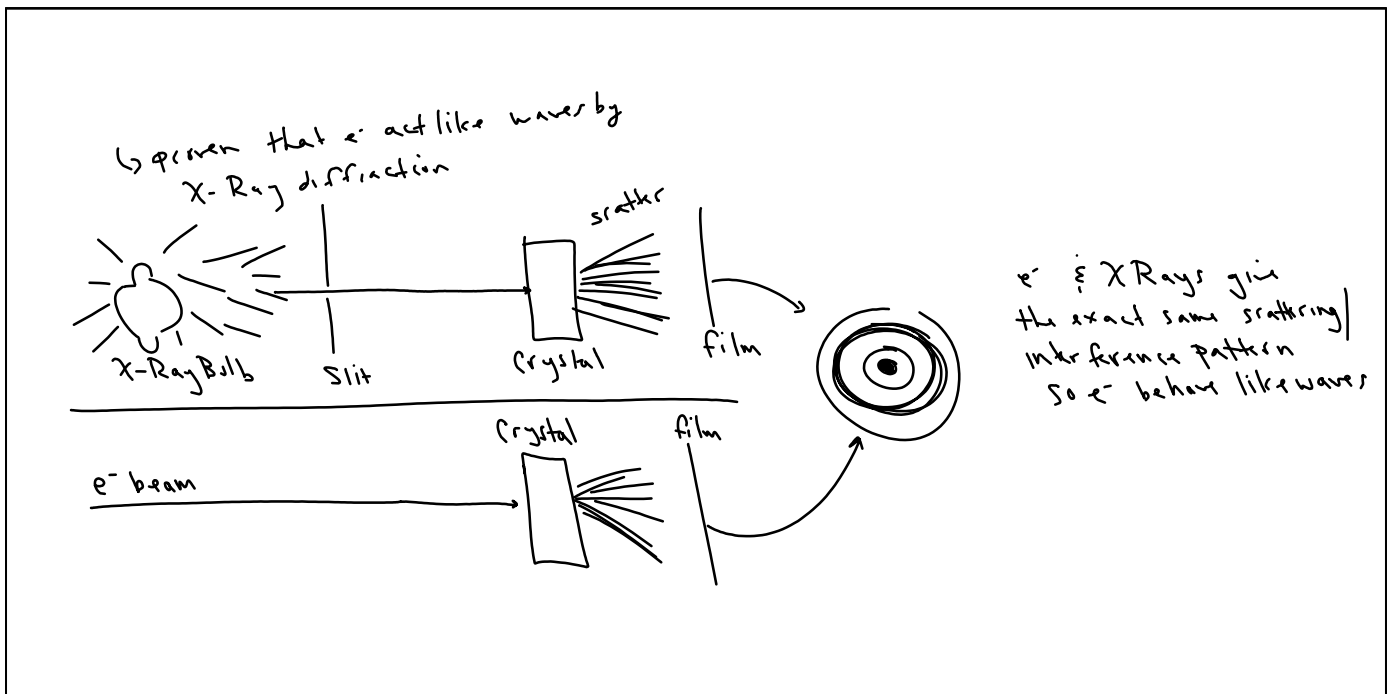


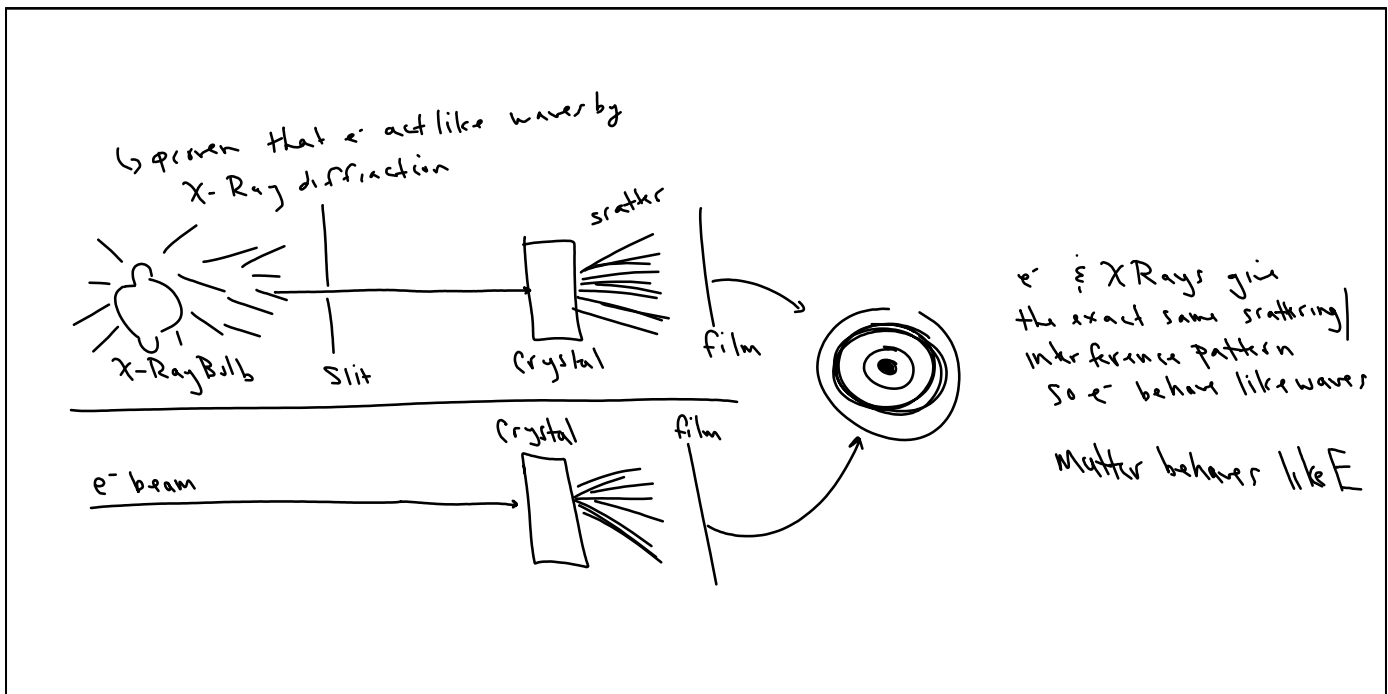


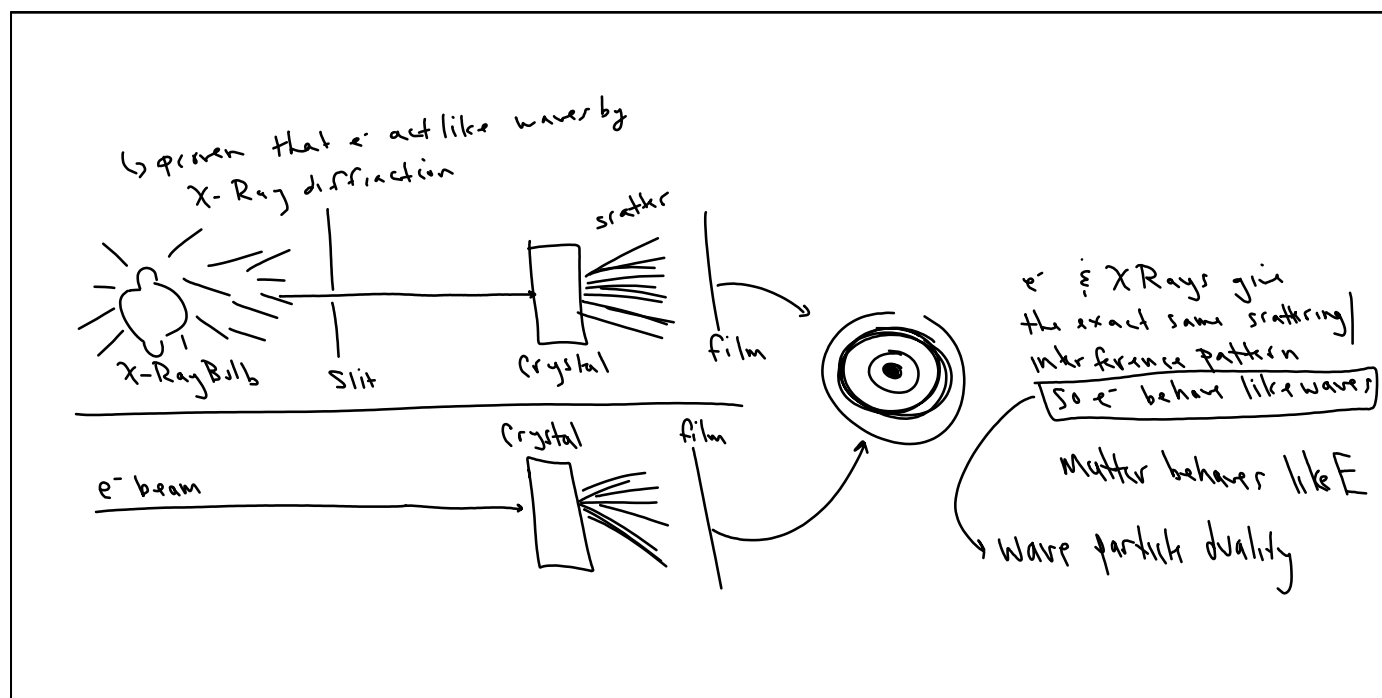












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↳ New Model Based on This

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Schrödinger - Wave Eqn

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Schrödinger - Wave Eqn - correctly describes wave behavior
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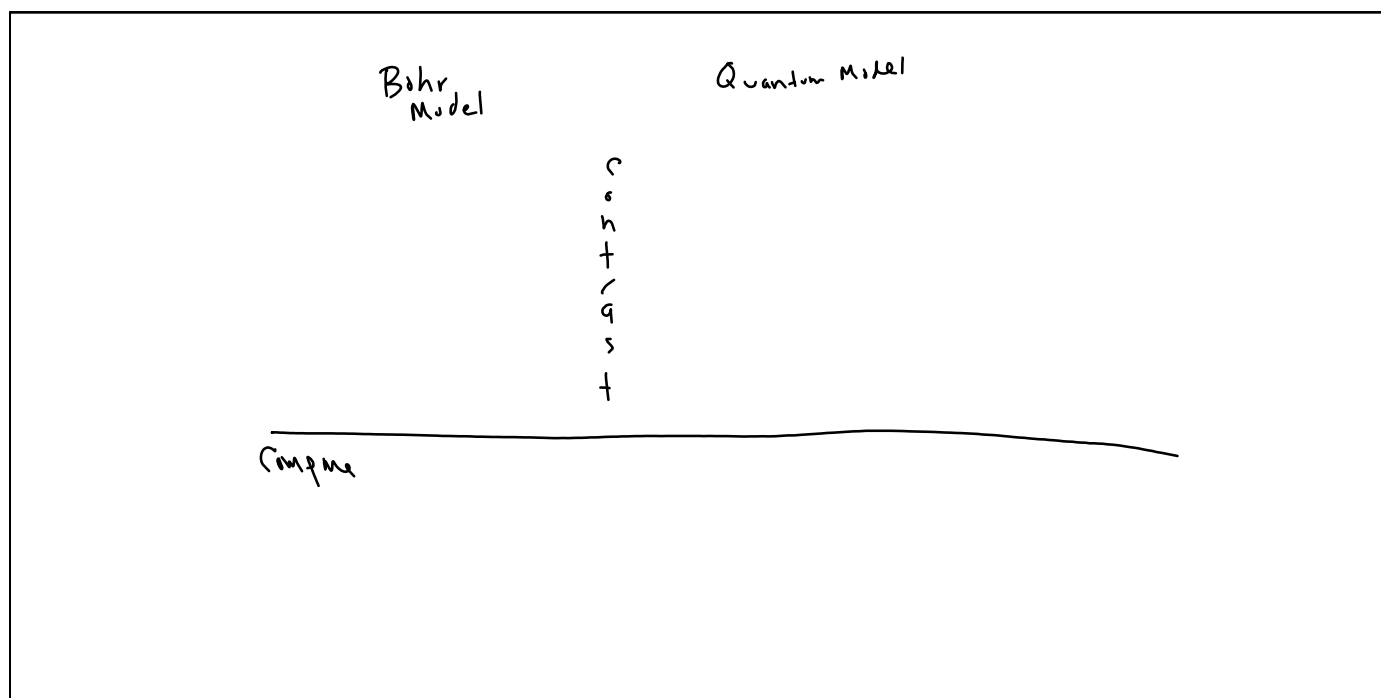
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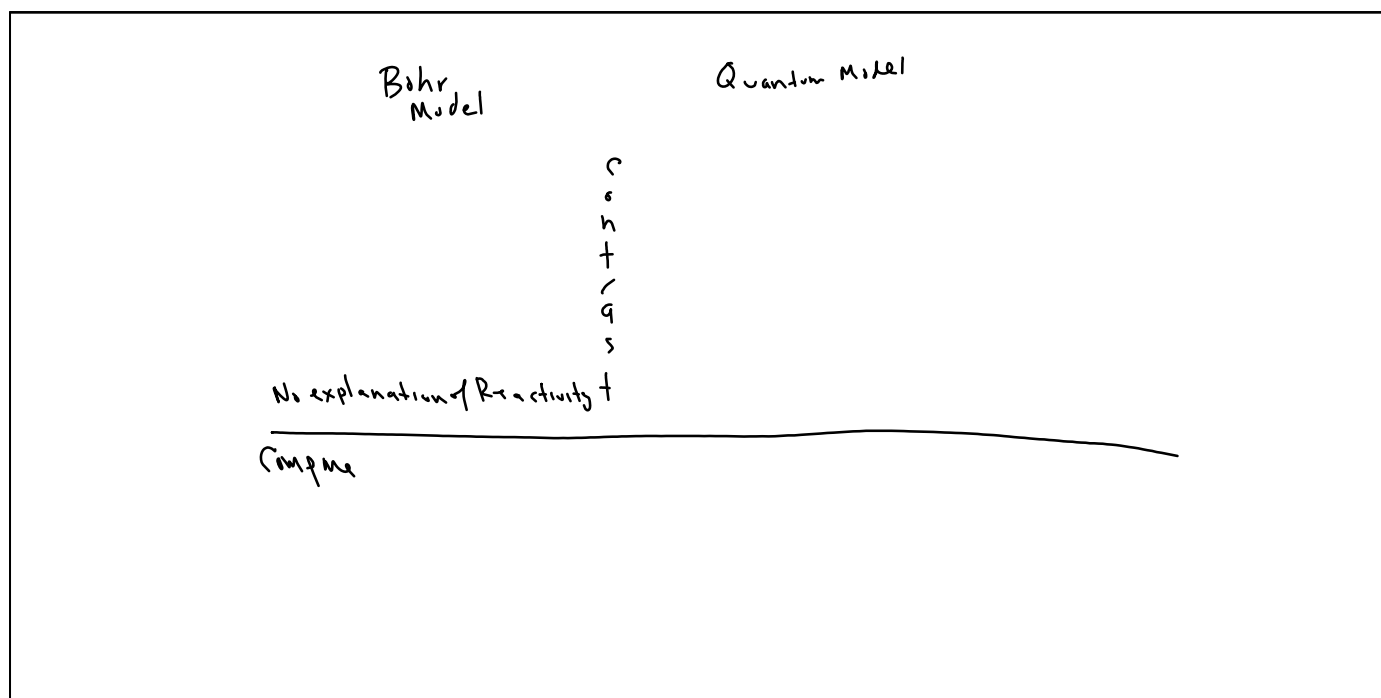
Heisenberg -

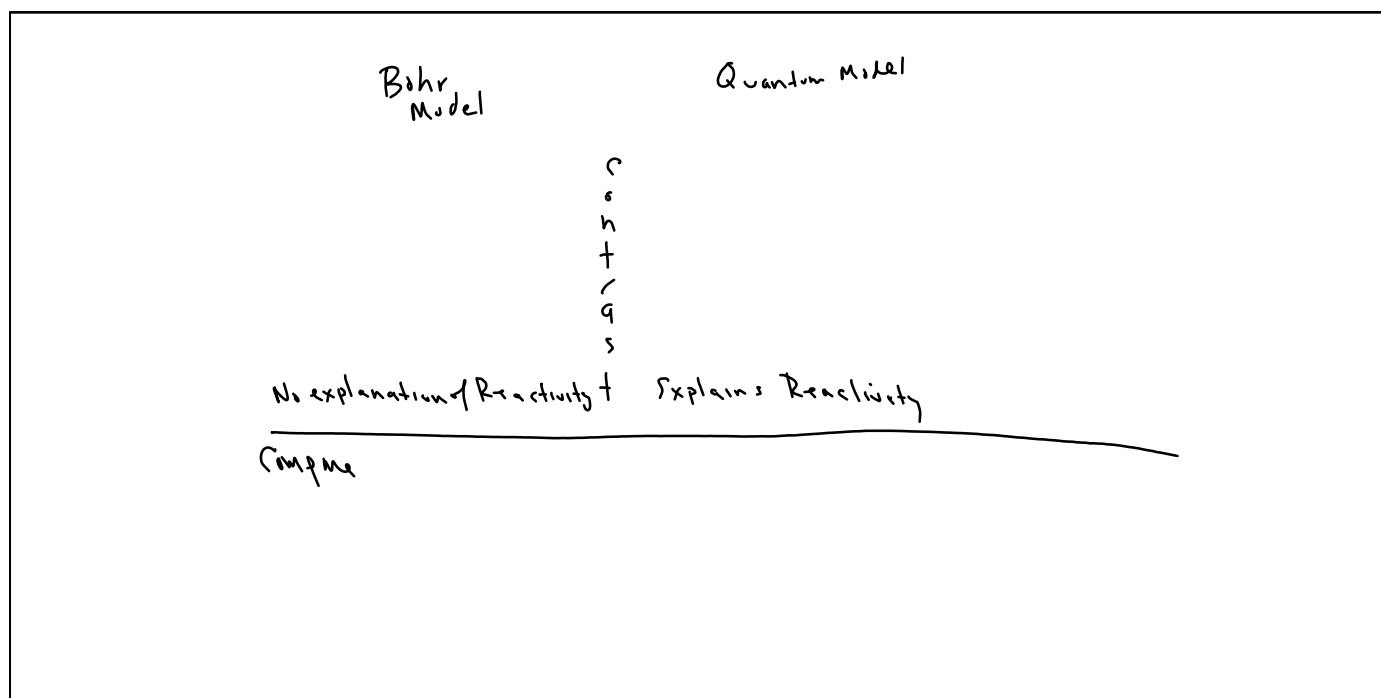
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Schrödinger - Wave Eqn - correctly describes wave behavior
(so e^- work too)
↳ soln's of this eqn give us current model

Heisenberg - Uncertainty Principle - It is impossible to simultaneously know where an e^- is and how fast it's going. We can only know the spot w/ the highest probability of finding an e^- .







Bohr Model	Quantum Model
e^- in 2D circular orbits	s p d f g h
No explanation of Reactivity	Explains Reactivity
Complete	

Bohr Model	Quantum Model
e^- in 2D circular orbits	e^- are in 3D orbitals
s	
p	
d	
f	
g	
h	

No explanation of Reactivity	Explains Reactivity
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Compare In Both, e^- gain E, jump to higher E-levels, are unstable and fall back & releasing light.

Bohr Model	Quantum Model
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Bohr Model

e^- in 2D circular orbits

e^- behave like particles

No explanation of Reactivity

Quantum Model

e^- are in 3D orbitals

e^- act like waves

can't pinpoint e^- location

Explains Reactivity

Compare In Both, e^- gain E, jump to higher E-levels, are unstable and fall back & releasing light.

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Explains Reactivity

Compare In Both, e^- gain E, jump to higher E-levels, are unstable and fall back & releasing light.

dist from nucleus to 1st E-level same in both

Parts of Q-Model

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1. Principle Quantum # (n)

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(7)

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 $n = 1 \rightarrow \infty$
(+)
2. angular momentum Q# (l)
↳ orbital that e^- 's are in w/in an E-level
 $l = s, p, d, f$

3 Info about orbitals

orbital

total
suborbitals

of
e⁻/sub

total #
e⁻

3 Info about orbitals

orbital

S

total
suborbitals

of
e⁻/sub

total #
e⁻

shape

3 Info about orbitals

orbital

S

total
suborbitals

1

of
e⁻/sub

total #
e⁻

shape

3 Info about orbitals

orbital

5

total
suborbitals

1

of
e⁻/sub

2

total #
e⁻

2

shape

3 Info about orbitals

orbital

S

total
suborbitals

1

of
e⁻/sub

2

total #
e⁻

2

shape

○ spherical

3 Info about orbitals

orbital

S

P

total
suborbitals

1

3

of
e⁻/sub

2

total #
e⁻

2

shape

○ spherical

3 Info about orbitals

orbital

S

P

total
suborbitals

1

3

of
e⁻/sub

2

2

total #
e⁻

2

6

shape

○ spherical

3 Info about orbitals

orbital

S

P

total
suborbitals

1

3

of
e⁻/sub

2


2

total #
e⁻

2

6

shape

 spherical



3 Info about orbitals

orbital

total
suborbitals

of
e⁻/sub

total #
e⁻


shape

S

1

2

2


 spherical

P

3

2

6



d

3 Info about orbitals

orbital

total
suborbitals

of
e⁻/sub

total #
e⁻


shape

s

1

2

2

 spherical

p

3

2


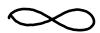
6




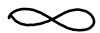

d

5


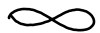

3 Info about orbitals

orbital	# of Suborbitals	# of e ⁻ /sub	# of e ⁻	shape
s	1	2	2	 spherical
p	3	2	6	
d	5	2	10	

3 Info about orbitals

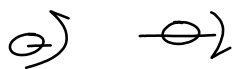
orbital	total suborbitals	# of e ⁻ /sub	total # e ⁻	shape
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3 Info about orbitals

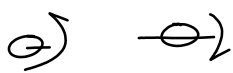
<u>orbital</u>	<u>total suborbitals</u>	<u># of e⁻/sub</u>	<u>total # e⁻</u>	<u>shape</u>
s	1	2	2	 spherical
p	3	2	6	
d	5	2	10	
f	7	2	14	<u>weird</u>

4. e⁻ spin
⓪

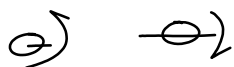
4. e⁻ spin



4. e⁻ spin


↳ spinning causes magnetism

4. e^- spin

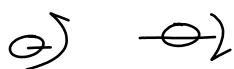


↳ spinning causes magnetism

5. Rules to follow

Aufbau principle → e^- are added to E levels from lowest to highest E

4. e^- spin



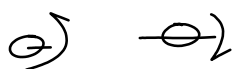
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7s 7p
6s 6p 6d
5s 5p 5d 5f
4s 4p 4d 4f
3s 3p 3d
2s 2p
1s

4. e^- spin

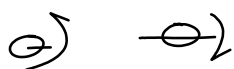


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5s 5p 5d 5f
4s 4p 4d 4f
3s 3p 3d
2s 2p
1s

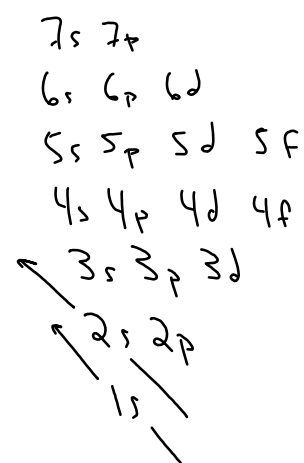
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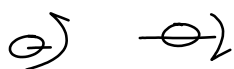
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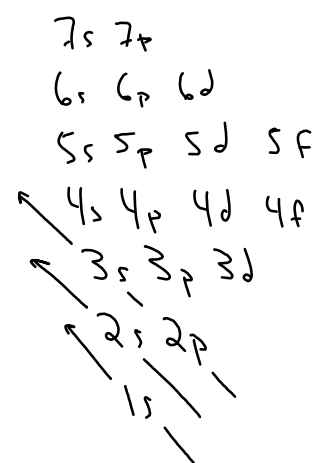
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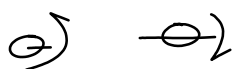
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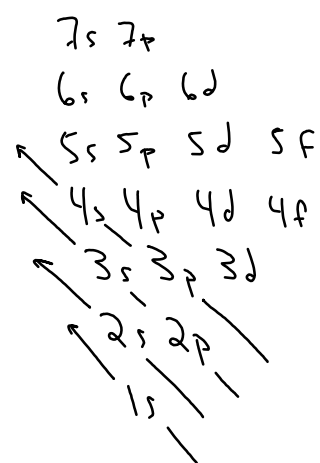
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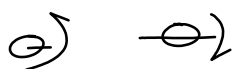
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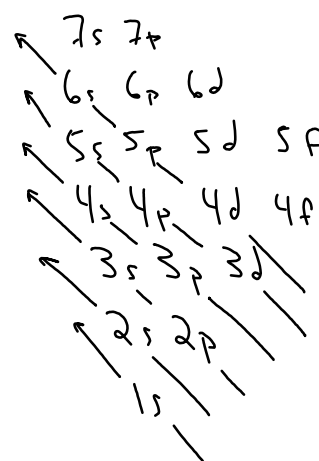
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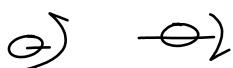
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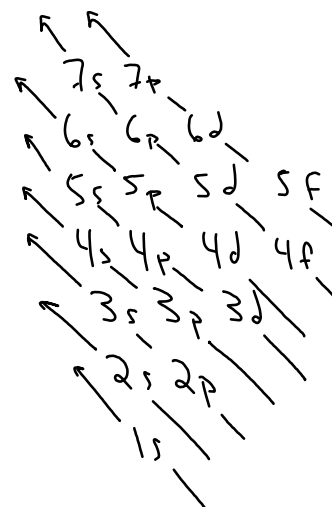
Aufbau principle → e^- are added to E levels from lowest to highest E



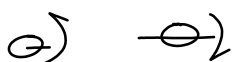
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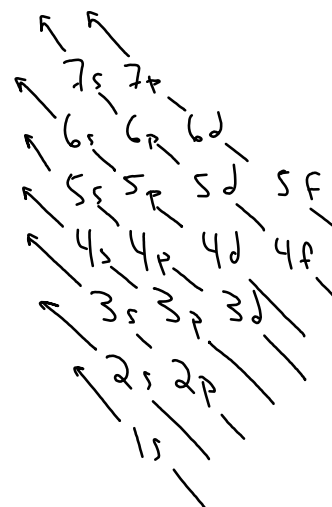
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Aufbau principle → e^- are added to E levels from
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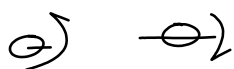
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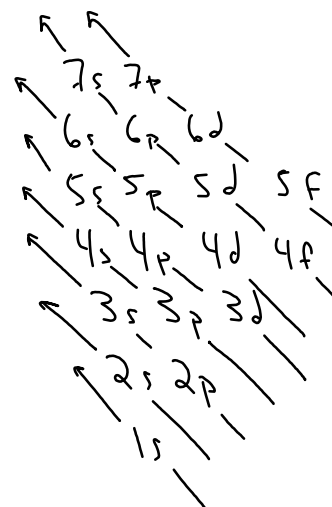


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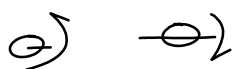
5. Rules to follow

Aufbau principle → e^- are added to E levels from lowest to highest E

Hund's Rule → $1e^-$ per suborbital b/f doubling



4. e^- spin

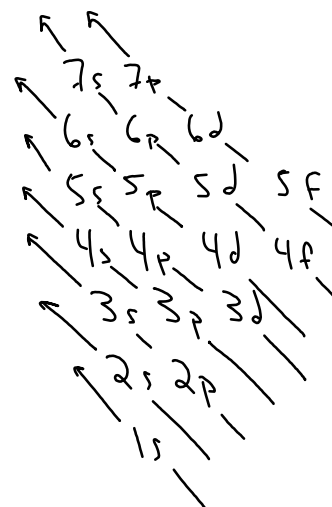


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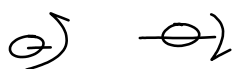
5. Rules to follow

Aufbau principle → e^- are added to E levels from lowest to highest E

Hund's Rule → 1 e^- per suborbital b/f doubling



4. e^- spin



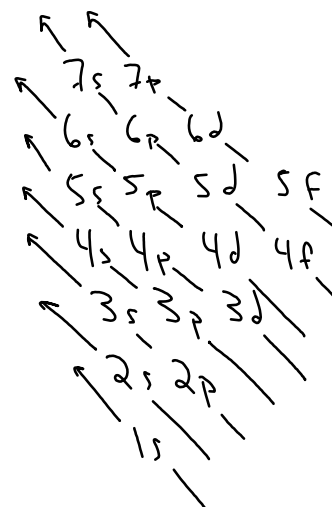
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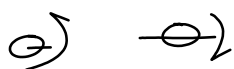
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Hund's Rule → $1e^-$ per suborbital b/f doubling

Pauli Exclusion Principle -



4. e^- spin



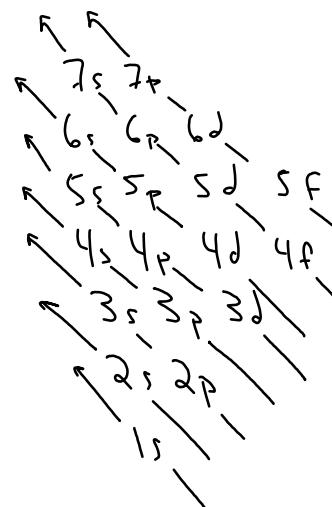
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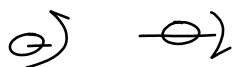
Aufbau principle → e^- are added to E levels from lowest to highest E

Hund's Rule → $1e^-$ per suborbital b/f doubling

Pauli Exclusion Principle - no $2e^-$ can have the same 4 Q #'s



4. e^- spin



↳ spinning causes magnetism

5. Rules to follow

Aufbau principle

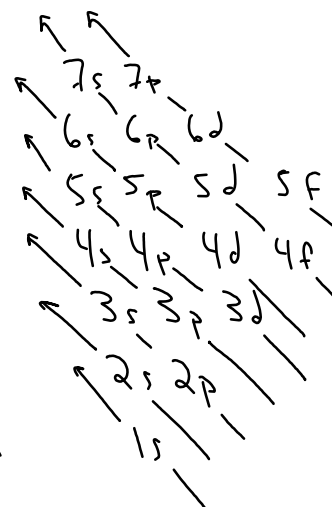
→ e^- are added to E levels from lowest to highest E

Hund's Rule

→ $1e^-$ per suborbital b/f doubling

Pauli Exclusion Principle

- no $2e^-$ can have the same 4 Q #'s (no $2e^-$ can be in same place at same time)



Notations

Notations

e⁻ configuration notation

Notations

e⁻ configuration notation

$nl^{#e^-}$

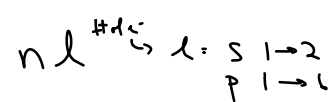
Notations

e- configuration notation

$$n l^{#d\uparrow\downarrow} l = s \rightarrow 2$$

Notations

e- configuration notation



Notations

e⁻ configuration notation

$n l^{#e^-}$

s	1 → 2
p	1 → 6
d	1 → 10
f	1 → 14

Notations

e⁻ configuration notation
↳ indicates E-level (n) + orbital (l) ← max in

$nl^{#e^-}$

s	1 → 2
p	1 → 6
d	1 → 10
f	1 → 14

Notations

e⁻ configuration notation

↳ indicates E-level (n) + orbital (l) ← max in

n l # of e⁻ l: s 1 → 2
p 1 → 6
d 1 → 10
f 1 → 14

Ex: H | 1e⁻
↳ 1s¹

Li 3e⁻
↳

Notations

e⁻ configuration notation
↳ indicates E-level (n) + orbital (l) ← max in

n l # of e⁻ l: s 1 → 2
p 1 → 6
d 1 → 10
f 1 → 14

Ex: H | 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

Notations

e⁻ configuration notation

↳ indicates E-level (n) + orbital (l) ← max in

n l #e⁻

s	1 → 2
p	1 → 6
d	1 → 10
f	1 → 14

Ex: H | 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

F 9e⁻
↳

Notations

e⁻ configuration notation

↳ indicates F-level (n) + orbital (l) ← max in

n l # of e⁻ l: s 1 → 2
p 1 → 6
d 1 → 10
f 1 → 14

Ex: H 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

F 9e⁻
↳ 1s²

Notations

e⁻ configuration notation

↳ indicates E-level (n) + orbital (l) ← max in

n l # of e⁻ l: s 1 → 2
p 1 → 6
d 1 → 10
f 1 → 14

Ex: H 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

F 9e⁻
↳ 1s² 2s²

Notations

e⁻ configuration notation

↳ indicates E-level (n) + orbital (l) ← max in

n l # of e⁻ l: s 1 → 2
p 1 → 6
d 1 → 10
f 1 → 14

Ex: H 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

F 9e⁻
↳ 1s² 2s² 2p⁵

Si

Notations

e⁻ configuration notation

↳ indicates E-level (n) + orbital (l) ← max in

n l #e⁻ l: s 1→2
p 1→6
d 1→10
f 1→14

Ex: H 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

F 9e⁻
↳ 1s² 2s² 2p⁵

Si
(14e⁻)

3p²

Notations

e⁻ configuration notation

↳ indicates E-level (n) + orbital (l) ← max in

n l # of e⁻ l: s 1 → 2
p 1 → 6
d 1 → 10
f 1 → 14

Ex: H 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

F 9e⁻
↳ 1s² 2s² 2p⁵

Si (14e⁻) 1s² 2s² 2p⁶ 3s² 3p²

Notations

e⁻ configuration notation

↳ indicates E-level (n) + orbital (l) ← max in

n l # of e⁻ l: s 1 → 2
p 1 → 6
d 1 → 10
f 1 → 14

Ex: H 1e⁻
↳ 1s¹

Li 3e⁻
↳ 1s² 2s¹

F 9e⁻
↳ 1s² 2s² 2p⁵

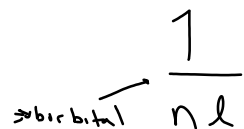
Si (14e⁻) 1s² 2s² 2p⁶ 3s² 3p²

orbital notation

orbital notation

$$\frac{1}{nl}$$

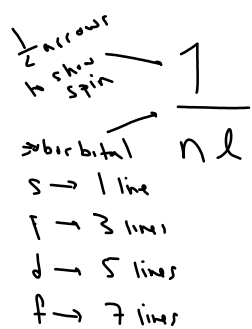
orbital notation



orbital notation

$\begin{array}{c} \nearrow \\ \text{orbital} \end{array} \frac{1}{nl}$
 $s \rightarrow 1 \text{ line}$
 $p \rightarrow 3 \text{ lines}$
 $d \rightarrow 5 \text{ lines}$
 $f \rightarrow 7 \text{ lines}$

orbital notation



orbital notation

$\frac{1}{2}$ arrows
↑ show
spin
↑
orbital nl

s → 1 line

p → 3 lines

d → 5 lines

f → 7 lines

H $\frac{1}{1s}$

orbital notation

$\frac{1}{2}$ arrows
↑ show
spin

↑

H

$\frac{1}{1s}$

↑ orbital

$n l$

Li (3⁻)

s → 1 line

p → 3 lines

d → 5 lines

f → 7 lines

orbital notation

$\frac{1}{2}$ arrows
↑ show
spin → \uparrow

orbital $n l$

s → 1 line

p → 3 lines

d → 5 lines

f → 7 lines

H $\frac{1}{1s}$

Li (3e-) $\overline{1s}$ $\overline{2s}$

orbital notation

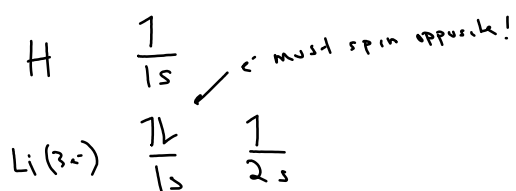
$\frac{1}{2}$ arrows
↑ show spin
↑ orbital
↑ $n l$

s → 1 line
p → 3 lines
d → 5 lines
f → 7 lines

H $\frac{1}{1s}$
Li (3e-) $\frac{1\downarrow}{1s} \quad \frac{\quad}{2s}$

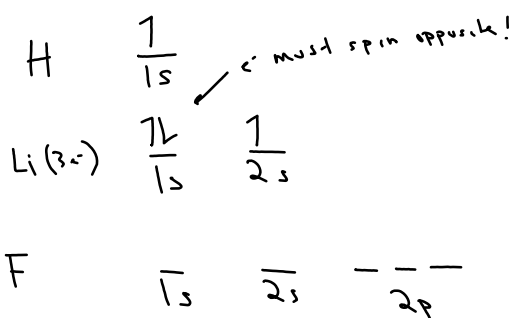
Orbital notation

$\frac{1}{2}$ arrows
 show spin $\rightarrow \uparrow$
 orbital $\rightarrow \underline{\hspace{1cm}}$
 $s \rightarrow 1 \text{ line}$
 $p \rightarrow 3 \text{ lines}$
 $d \rightarrow 5 \text{ lines}$
 $f \rightarrow 7 \text{ lines}$



Orbital notation

$\frac{1}{2}$ arrows
 show spin
 → orbital $n l$
 s → 1 line
 p → 3 lines
 d → 5 lines
 f → 7 lines

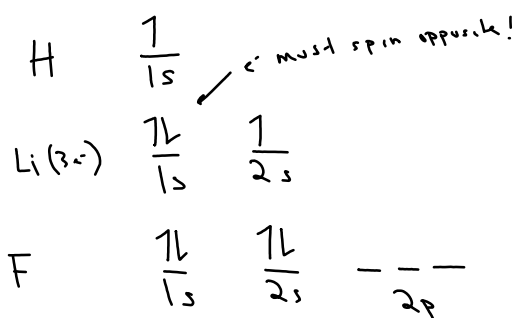


$\frac{1}{2}$ narrow
 to show spin

$\frac{1}{2}$

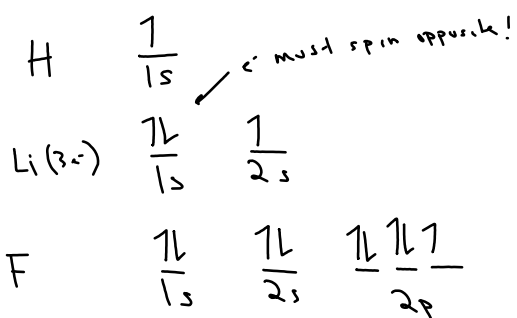
2 orbital $n l$

$s \rightarrow 1$ line
 $p \rightarrow 3$ lines
 $d \rightarrow 5$ lines
 $f \rightarrow 7$ lines



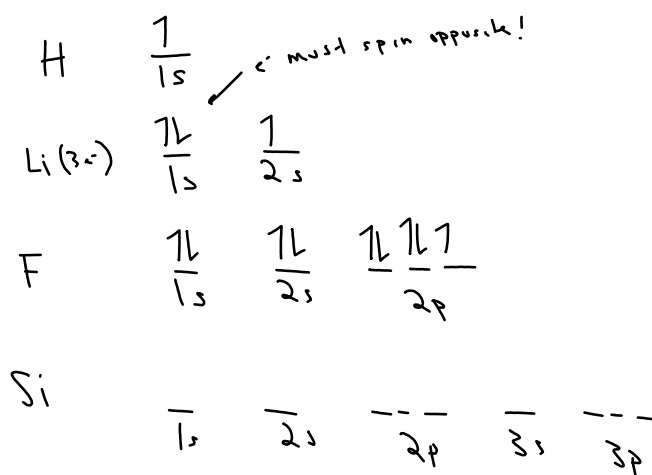
Orbital notation

$\frac{1}{2}$ arrows
 show spin
 \rightarrow orbital
 $n l$
 $s \rightarrow 1 \text{ line}$
 $p \rightarrow 3 \text{ lines}$
 $d \rightarrow 5 \text{ lines}$
 $f \rightarrow 7 \text{ lines}$



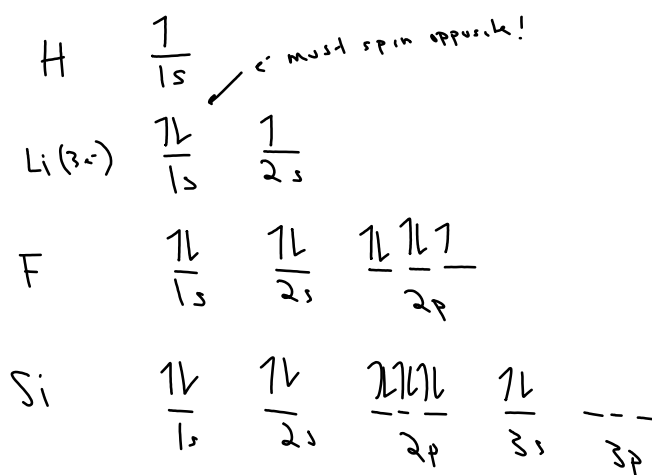
Orbital notation

$\frac{1}{2}$ arrows
 show spin
 → orbital
 $n l$
 s → 1 line
 p → 3 lines
 d → 5 lines
 f → 7 lines



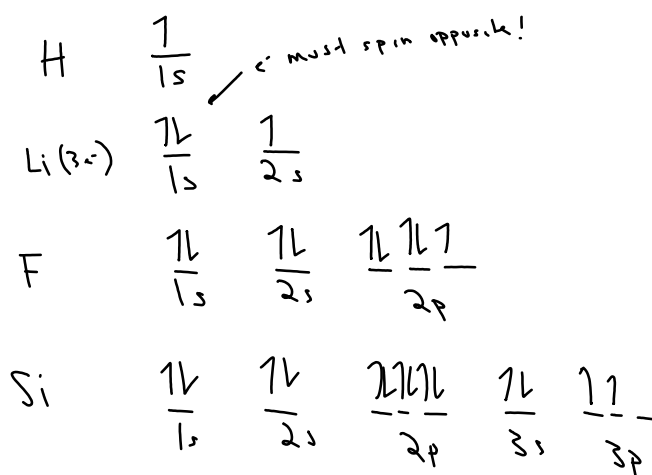
Orbital notation

$\frac{1}{2}$ arrows
 show spin
 → orbital
 $n l$
 $s \rightarrow 1$ line
 $p \rightarrow 3$ lines
 $d \rightarrow 5$ lines
 $f \rightarrow 7$ lines



Orbital notation

$\frac{1}{2}$ arrows
 show spin
 → orbital
 $n l$
 s → 1 line
 p → 3 lines
 d → 5 lines
 f → 7 lines



d-Block element configs

d-Block element configs

Ni - 28e⁻

e⁻ config

d-Block element configs

Ni - 28e⁻

e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$

d-Block element configs

Ni - 28e⁻

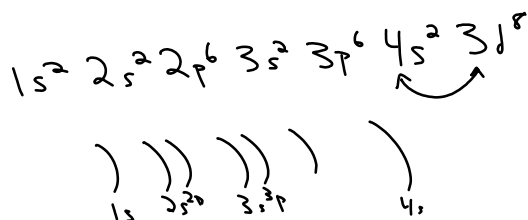
e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$

$\begin{array}{ccc}) &)) &)) \\ 1s & 2s^2 & 3s^2 3p \end{array}$

d-Block element configs

Ni - 28e⁻

e⁻ config



d-Block element configs

Ni - 28e⁻

e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$

$\begin{array}{ccccccccc}) &)) &))) &) & & & & & \\ 1s & 2s^2 & 3s^2 & 3p & 3d & & & & 4s \end{array}$

d-Block element configs

Ni - 28e⁻

e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

$\begin{array}{cccccc}) &)) &)) &) & &) \\ 1s & 2s^2 & 3s^2 & 3p & 3d & 4s \end{array}$

d-Block element configs

Ni - 28e⁻

e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

Always group
by E-level (n)

$\begin{array}{cccccc}) &)) &))) &) & &) \\ 1s & 2s^2 & 3s^2 3p & 3d & & 4s \end{array}$

d-Block element configs

Ni - 28e⁻

e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$

Always group
by E-level (n)

$\overline{1s} \quad \overline{2s} \quad \overline{2p} \quad \overline{3s} \quad \overline{3p} \quad \overline{3d} \quad \overline{4s}$

d-Block element configs

Ni - 28e⁻

e⁻ config

1s² 2s² 2p⁶ 3s² 3p⁶ 3d⁸ 4s²

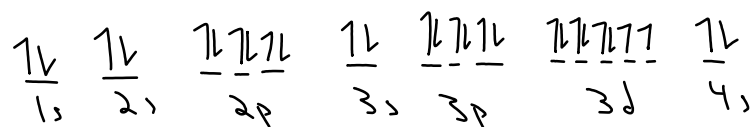
Always group
by E-level (n)

$\frac{1\downarrow}{1s}$	$\frac{1\downarrow}{2s}$	$\frac{1\downarrow 1\downarrow 1\downarrow}{2p}$	$\frac{1\downarrow}{3s}$	$\frac{1\downarrow 1\downarrow 1\downarrow}{3p}$	-----	$\frac{1\downarrow}{4s}$
					3d	

d-Block element configs

Ni - 28e⁻

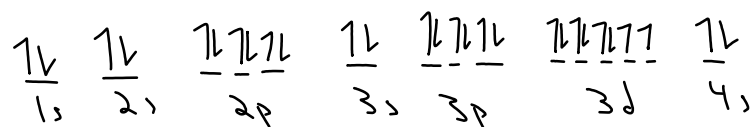
e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$ Always group
by E-level (n)



d-Block element configs

Ni - 28e⁻

e⁻ config $1s^2 2s^2 2p^6 3s^2 3p^6 3d^8 4s^2$ Always group
by E-level (n)



d-Block element configs

Fe - 26 e⁻

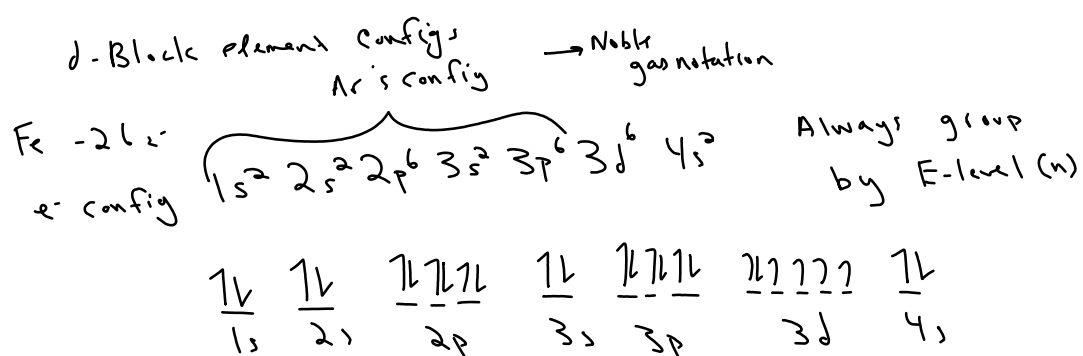
e⁻ config

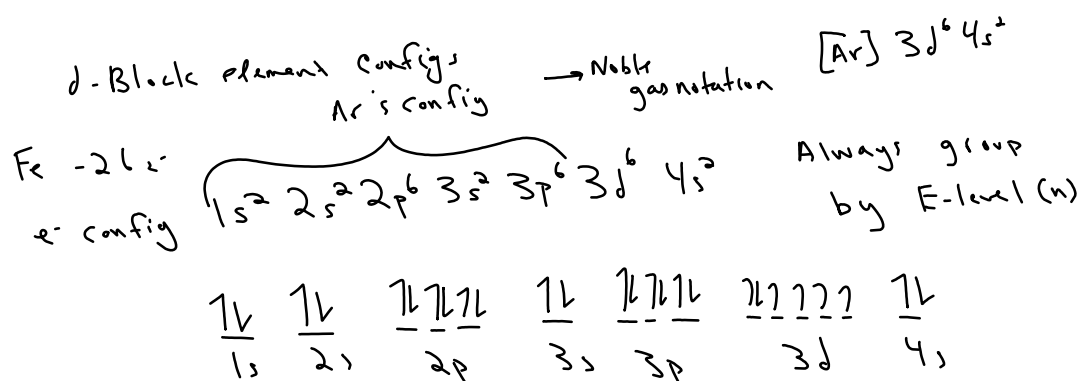
$1s^2 2s^2 2p^6 3s^2 3p^6 3d^6 4s^2$

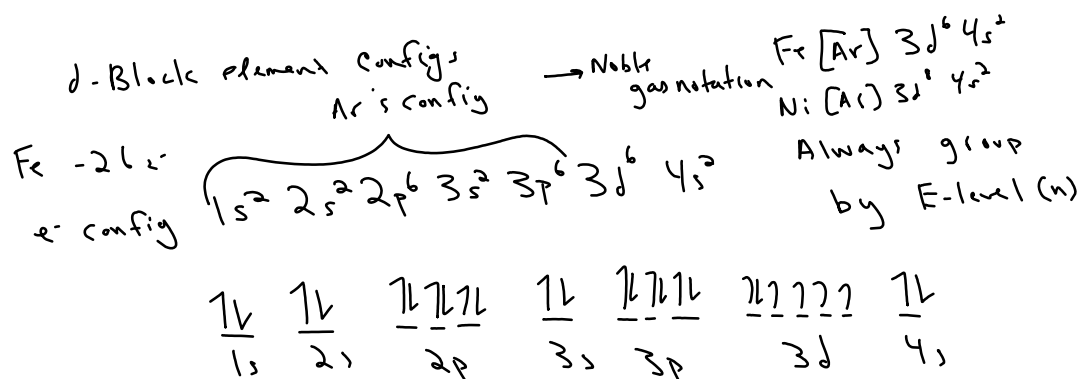
Always group
by E-level (n)

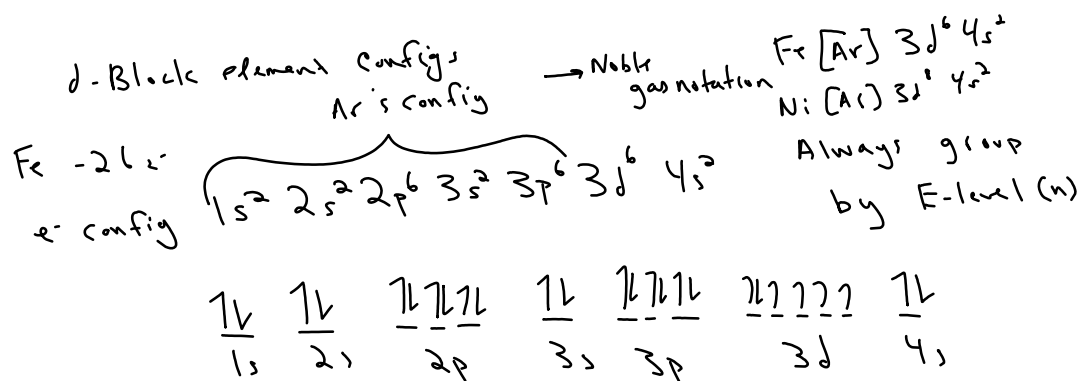
$\frac{1\downarrow}{1s}$	$\frac{1\downarrow}{2s}$	$\frac{1\downarrow 1\downarrow 1\downarrow}{2p}$	$\frac{1\downarrow}{3s}$	$\frac{1\downarrow 1\downarrow 1\downarrow}{3p}$	$\frac{1\downarrow 1\downarrow 1\downarrow 1\downarrow}{3d}$	$\frac{1\downarrow}{4s}$
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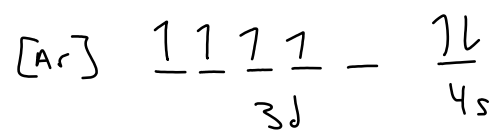
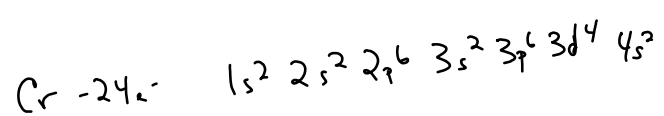


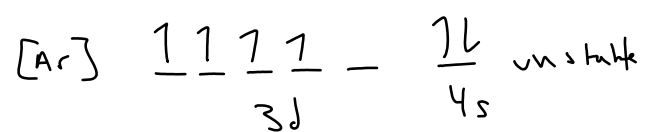
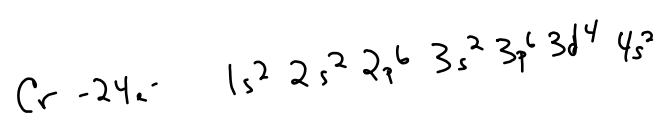
Cr -242

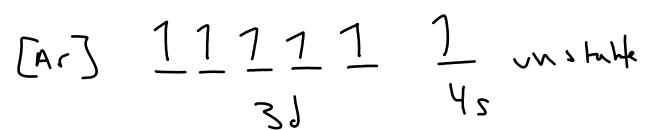
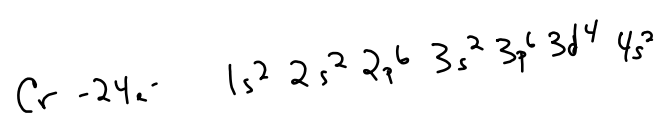
Cr -24e- $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$

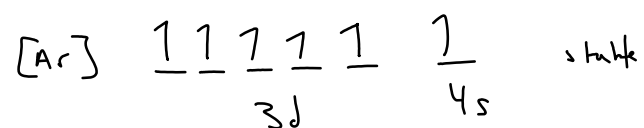
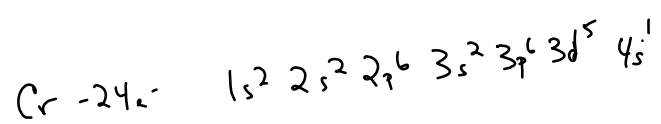
Cr -24e- $1s^2 2s^2 2p^6 3s^2 3p^6 3d^4 4s^2$

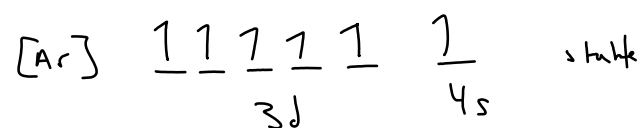
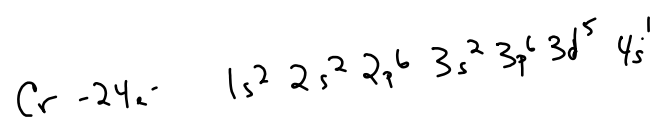
[Ar]

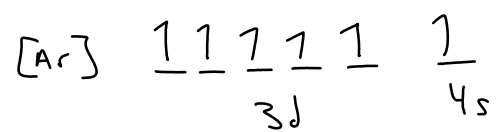
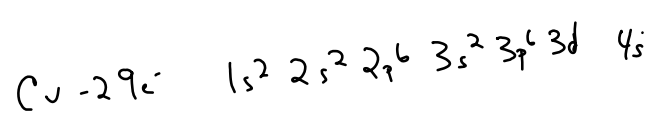


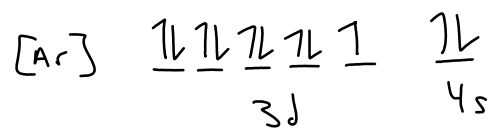
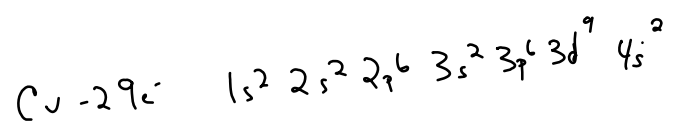


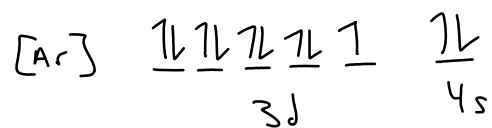
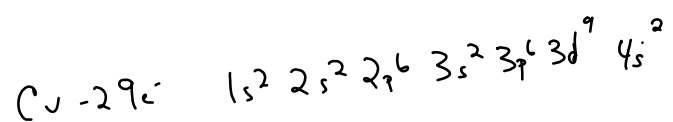


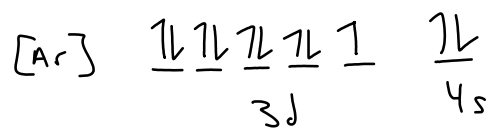
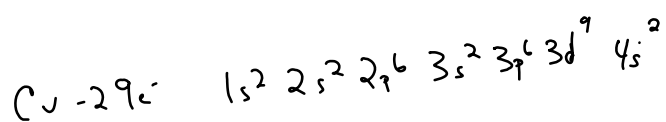




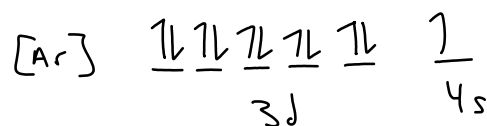
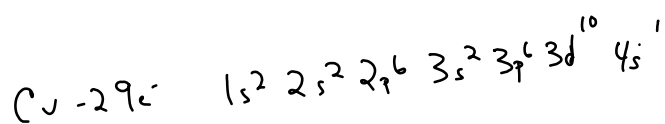








an s e⁻
 drops ↓
 + fill 3d



an s⁺ e⁻
drops ↓
+ fill 3d

valence e^-
: e^- dot notation



valence e^-
i.e. dot notation

valence e^-



valence e^-
i.e. dot notation

valence e^- - outer shell e^-



valence e^-
i.e. dot notation

valence e^- - outer shell e^-
↳ highest E-level: s+p e^-



valence e^-
i.e. dot notation

valence e^- - outer shell e^-
↳ highest E-level: s+p e^-
↳ max of 8 e^-



valence e^-
i.e. dot notation

Br
3 e^-

valence e^- - outer shell e^-
↳ highest E-level: s+p e^-
↳ max of 8 e^-



valence e^-
i.e. dot notation

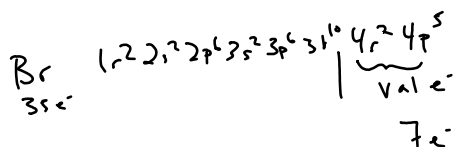
Br $1s^2 2s^2 2p^6 3s^2 3p^4 3d^{10} 4s^2 4p^5$
 $3s^2$

valence e^- - outer shell e^-
↳ highest E-level: s + p e^-
↳ max of 8 e^-



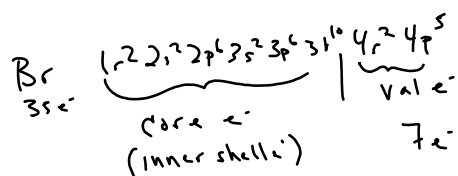
valence e^-
i.e. dot notation

valence e^- - outer shell e^-
↳ highest E-level: s + p e^-
↳ max of 8 e^-



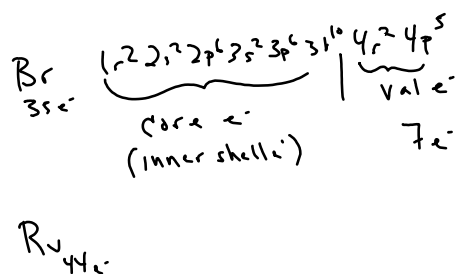
valence e^-
 \cdot e^- dot notation

valence e^- - outer shell e^-
 \hookrightarrow highest E-level: s+p e^-
 \hookrightarrow max of 8 e^-



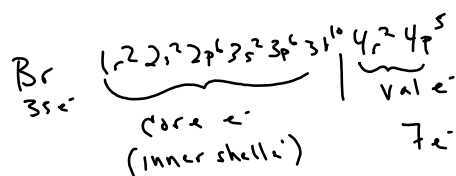
valence e^-
 \cdot e^- dot notation

valence e^- - outer shell e^-
 \hookrightarrow highest E-level: s+p e^-
 \hookrightarrow max of 8 e^-



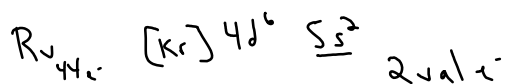
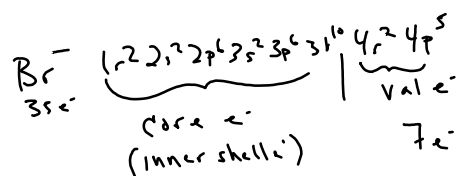
valence e^-
 \cdot e^- dot notation

valence e^- - outer shell e^-
 \hookrightarrow highest E-level: s + p e^-
 \hookrightarrow max of 8 e^-



valence e^-
 \cdot e^- dot notation

valence e^- - outer shell e^-
 \hookrightarrow highest E-level's s+p e^-
 \hookrightarrow max of 8 e^-



π - dot notation

e- dot notation

↳ dots used to
depict value

e- dot notation

↳ dots used to
depict val e-

Ex



e- dot notation

↳ dots used to
depict val e-

Ex



Sym

e- dot notation

↳ dots used to
depict val e-

Ex



Sym

e- dot notation

↳ dots used to
depict val e-

Ex



2 Sym

e- dot notation

↳ dots used to
depict val e-

Σx

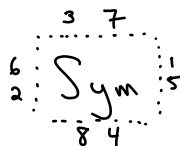
$\text{:}\ddot{\text{B}}\text{:}$

$\begin{matrix} & 3 \\ 2 & \boxed{\text{Sym}} \\ & 4 \end{matrix}$

e- dot notation

↳ dots used to
depict val e-

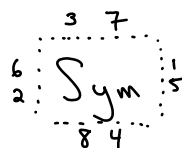
Ex



e- dot notation

↳ dots used to
depict val e-

Ex

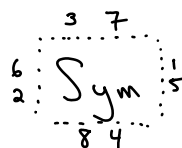


Dot order

e- dot notation

↳ dots used to
depict val e-

Ex



Dot order

K

Fe

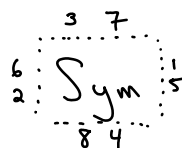
Ne

Be

e- dot notation

↳ dots used to depict val e-

Ex



Dot order

K•

•Fe•

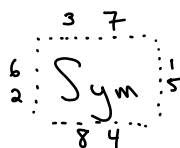
Be

Ne

e- dot notation

↳ dots used to depict val e-

Ex



Dot order

K•

•Fe•

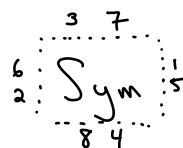
•Be•

Ne

e- dot notation

↳ dots used to depict val e-

Ex



Dot order

